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Accounting and Business Research Award

The trustees of the R. G. Leach Fund, which financed the original launching of **Accounting and Business Research,** have now offered a prize of £100 for an article published in the journal in 1972.
This award will be in addition to the normal fee paid for articles in **Accounting and Business Research.** The judging will be done by an independent panel, who will take into consideration the originality of the article and its relevance to current financial problems.

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Consolidated Nationalised Industries Accounts 1948-70: published figures adjusted for currency debasement.

D. B. Myddelton

This article contains conventional nationalised industry accounts adjusted to allow for currency debasement in the same way as my earlier article on the gas industry,* but it covers *all* major nationalised industries not just one, and it *consolidates* them. The article summarises both reported (conventional) and adjusted accounts year by year from 1948 to 1970 for Coal, Electricity, Post Office and Rail, and also presents both conventional and adjusted *consolidated* nationalised industry accounts, combining the accounts of the five main industries with those of other nationalised industries whose separate accounts are not reproduced. In the absence of details of 'inter-industry' transactions, the 'consolidation' simply adds the numbers together, with none of the usual consolidation adjustments.

Perhaps the single number that best represents the consolidated nationalised industries' overall results for the period is the average annual rate of profit before interest on assets employed. (The average flat yield on 2½ per cent Consols over the period was 5·4 per cent.) Table 1 shows that the average rate of

TABLE 1
Profit before interest/Assets (annual averages), 23 years, 1948–70

	Current, £s million			*Jan 1962, £s million*			*Dec 1971, £s million*		
	PBI	Assets	%	PBI	Assets	%	PBI	Assets	%
Before special write-offs									
Coal	24	644	3·7	10	804	1·2	16	1,271	1·2
Electricity	124	2,225	5·6	76	2,485	3·1	121	3,929	3·1
Gas	32	708	4·5	14	788	1·8	22	1,246	1·8
Post Office	59	1,032	5·7	52	1,182	4·4	81	1,869	4·4
Rail	(13)	1,278	(1·0)	(16)	1,970	(0·8)	(25)	3,114	(0·8)
	226	5,887	3·8	136	7,229	1·9	215	11,429	1·9
etc.	29	851	3·4	11	924	1·2	17	1,461	1·2
	255	6,738	3·8	147	8,153	1·8	232	12,890	1·8
After special write-offs									
Coal	11	644	1·7	(8)	804	(1·0)	(12)	1,271	(1·0)
Electricity	124	2,225	5·6	76	2,485	3·1	121	3,929	3·1
Gas	32	708	4·5	14	788	1·8	22	1,246	1·8
Post Office	59	1,032	5·7	52	1,182	4·4	81	1,869	4·4
Rail	(64)	1,278	(5·0)	(96)	1,970	(4·9)	(151)	3,114	(4·9)
	162	5,887	2·8	38	7,229	0·5	60	11,429	0·5
etc.	27	851	3·2	8	924	0·9	13	1,461	0·9
	189	6,738	2·8	46	8,153	0·6	73	12,890	0·6

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* *The Accountant*, 7 May 1970.

2·8 per cent per annum on average assets of ${}_{c}$£6,700 million on a conventional basis compares with an adjusted average rate of 0·6 per cent per annum on average assets of ${}_{71}$£12,900 million after currency debasement adjustments.

The subscript before the £ symbol shows the *kind* of money being referred to. '${}_{c}$£1' means 'one current (conventional) pound'; '${}_{62}$£1' means 'one (January) 1962 pound'; and '${}_{71}$£1' means 'one (December) 1971 pound'. Strictly speaking the subscript should reveal the month as well as the year involved. January 1962 is the base (100·0) of the current Retail Price Index used to make adjustments, and December 1971 is the latest available index at the time of writing. To convert January 1962 pounds into December 1971 pounds, simply multiply by 158·1 (the Retail Price Index for December 1971). The 36·7 per cent fall in the value of money over the decade (*not* 58·1 per cent) represents an average rate of currency debasement of 4·7 per cent per annum. (Since January 1948 the 63·5 per cent fall in the value of money represents an average rate of currency debasement of 4·3 per cent over the 24 years.) Individual industry accounts show adjusted figures in January 1962 £s million, but the consolidated accounts also convert the figures into December 1971 £s million. Showing figures to the nearest £1 million does not imply that degree of accuracy.

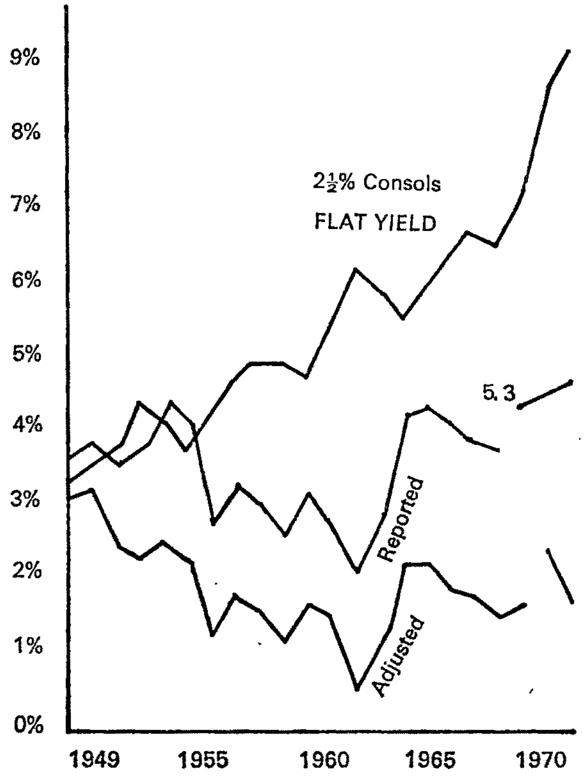
Four major capital reconstructions in the period covered involved substantial write-offs of assets. These losses – and they *are* losses – cannot easily be allocated to particular years, but overall totals for the 23-year period allow for them. Because most nationalised industries are financed almost entirely by interest-bearing government debt capital (BOAC, British Steel, and now London Transport are exceptions), comparison with mainly equity-financed companies is simplest on a before-interest basis. Since nationalised industries have borne virtually no tax on profits, it would seem reasonable to make any such comparisons before-tax too.

Chart 1 shows each year's consolidated rates of return before interest and before special write-offs. Rail's 1969 capital reconstruction causes a major discontinuity between 1968 and 1969. Reported and adjusted rates started in 1949 at about the same level – 3½ per cent – but by 1970 the reported rate was 4½ per cent while the adjusted rate was 1½ per cent. Chart 2 shows each industry's average annual return on assets over the whole period.

Conventional accounts understate both fixed assets and depreciation charges compared with adjusted figures. For the 20 years from 1951 to 1970, reported consolidated assets were consistently understated by about 25 per cent. Chart 3 shows reported and adjusted asset figures. Chart 4 shows the consolidated depreciation understatement growing throughout the period, amounting to 36 per cent by 1970. (Since 1956 the Post Office, accounting for 12 per cent of consolidated assets in 1970, has charged about one third more than conventional depreciation, without which the consolidated depreciation understatement in 1970 would have been 42 per cent.) Because depreciation exceeded profits before interest, reported consolidated figures overstate the latter even more than they understate depreciation. Though the level fluctuates, Chart 5 shows a rise over the period, from 22 per cent profit overstatement in 1951 to 56 per cent in 1970.

Chart 1.

Return on assets



Absolute reported and adjusted profits and losses *after* interest are shown, consolidated year by year in Chart 6, and overall for each industry in Chart 7. Table 2 shows summarised overall figures. Only the Post Office shows an adjusted profit after interest. The differences between all other reported and adjusted figures are substantial. Total consolidated losses after interest over the period amounted to ${}_{c}$£2,300 million on a conventional basis, and to no less than ${}_{71}$£8,300 million after currency debasement

Chart 2.

Return on assets

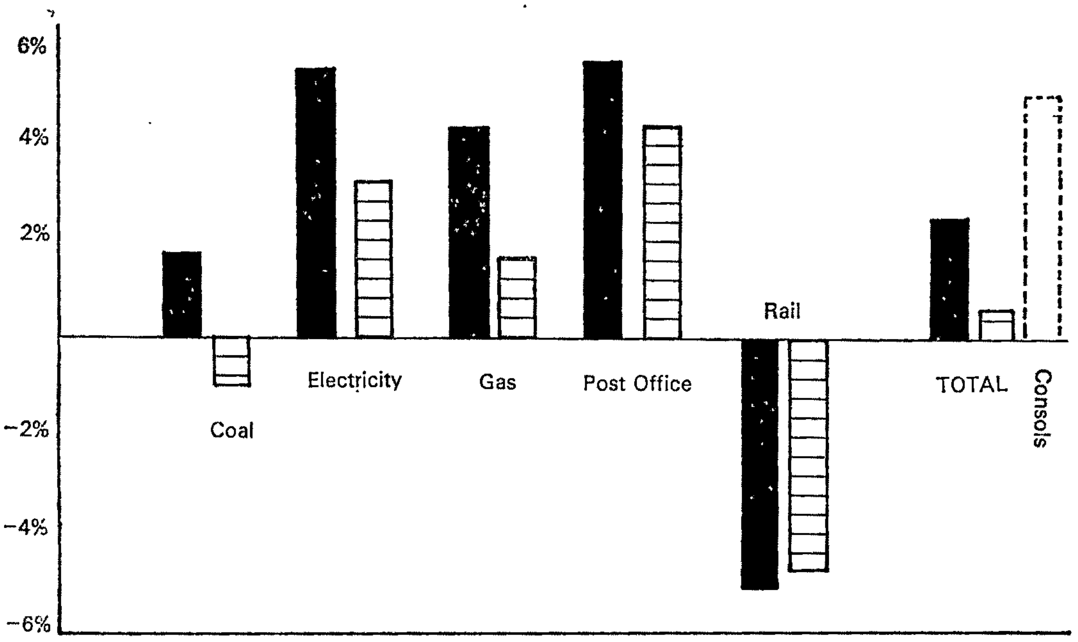


Chart 3.

Assets – Reported and Adjusted

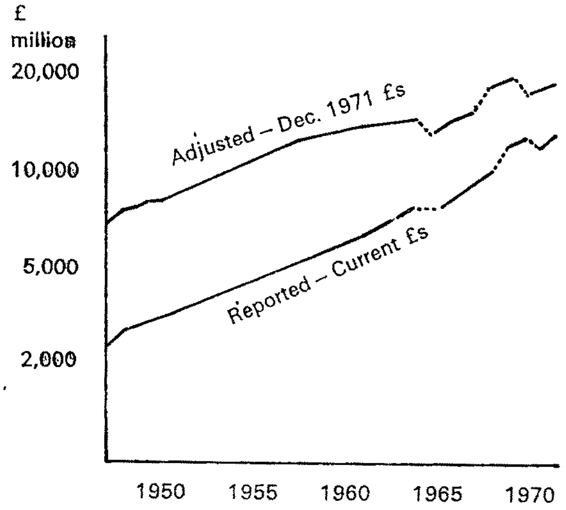


Chart 4.

Depreciation understatement

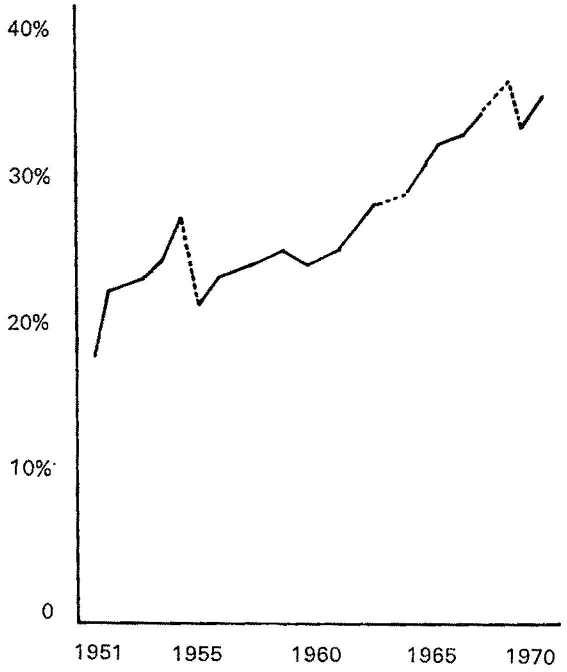
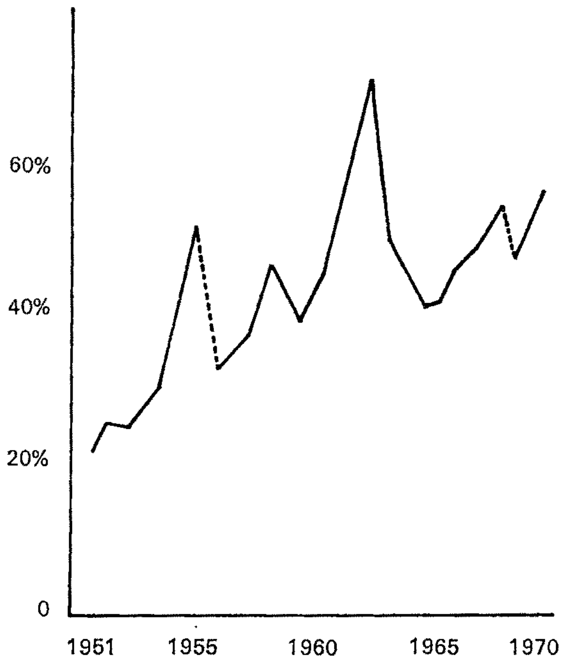


Chart 5.

Profit overstatement



adjustments. It should be remembered that not all nationalised industry capital bore interest during the whole period, and the interest rate charged was not necessarily as high as a normal commercial rate would have been.

Table 3 shows industry by industry a Capital Reconciliation statement, prepared on the basis that opening assets plus capital introduced minus closing assets equals losses. A business has made a profit if its assets now exceed what it started with plus subsequent net capital introduced. This approach makes it clear that capital write-offs are losses.

Table 4 shows consolidated nationalised industries accounts summarised year by year in terms of three different 'currencies' – conventional, January 1962 £s, and December 1971 £s.

Appendix 1 lists the 254 sets of accounts included in the consolidation, and Appendix 2 lists some of the largest nationalised concerns *not* included (size being the main criterion). Consolidated figures for a particular year, e.g. '1970', include accounts for periods ending on 31 October 1970 and on 31 March 1971, as well as accounts covering the calendar year 1970, but the appropriate indices have been used to adjust each individual set of accounts. In fact all the main nationalised industries except British Rail (which is now relatively unimportant in terms of book assets) now end their financial years on 31 March. Separate industry accounts show the end-of-period year (e.g. '1971' for Coal means the year ending on 31 March 1971).

There now follow some brief comments on major matters affecting each of the main industries consolidated.

Coal

Of the $_{c}$£415 million written off capital in 1966, $_{c}$£116 million losses had already accumulated, and only $_{c}$£299 million ($_{62}$£412 million) represents an extra loss.

Since 1966, grants received (mainly in respect of social costs) have reduced reported losses by a total of $_{c}$£46 million.

Electricity

The North of Scotland Hydro-Electric Board and the South of Scotland Electricity Board (total assets $_{c}$£750 million at March, 1971) publish accounts

Chart 6.

Profits and losses after interest
(before special write-offs)

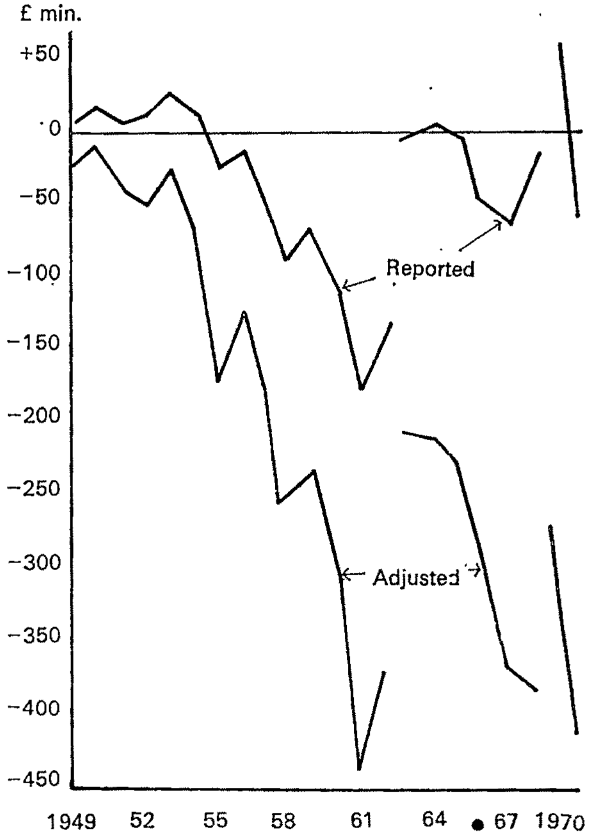


Chart 7.

Total profits and losses after interest

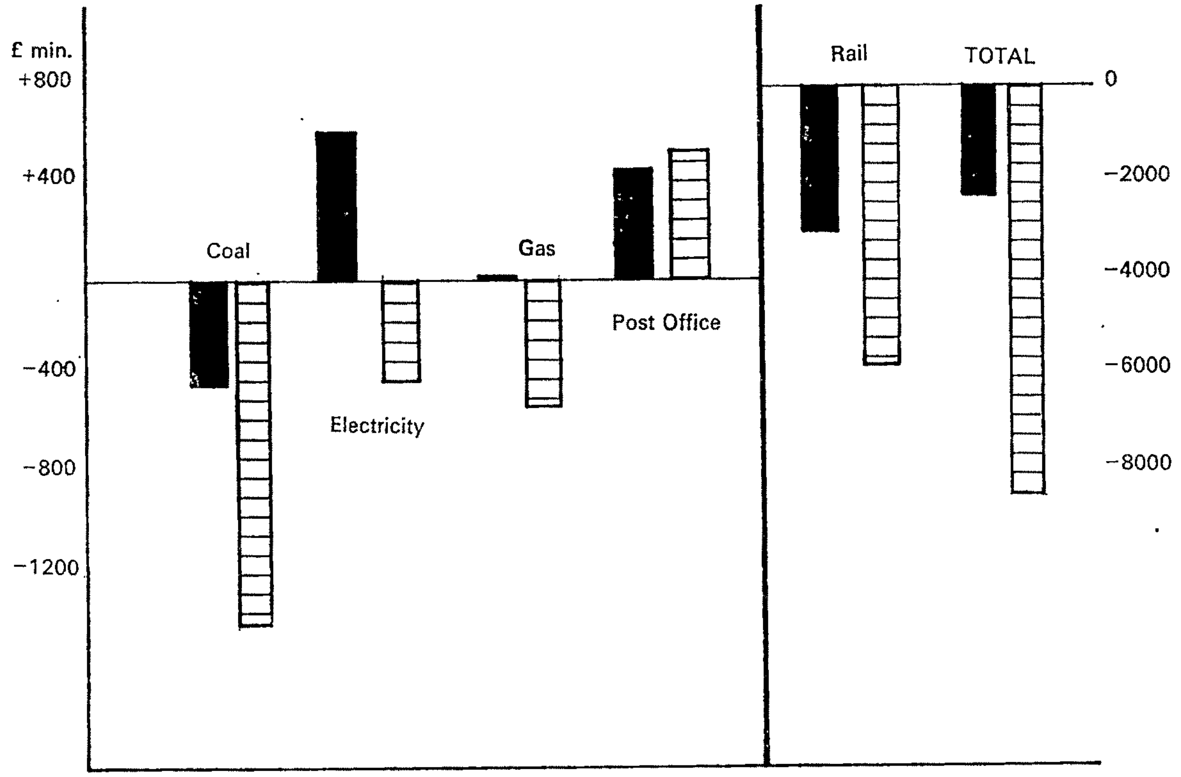


TABLE 2
Summary of profits and losses 1948–70

	Depreciation	*Special write-off*	*PBI*	*Interest*	*Profit (Loss) after interest*
Current, £s million					
Coal	1,133	299	253	660	(407)
Electricity	2,670	—	2,859	2,216	643
Gas	771	—	709	704	5
Post Office	1,426	—	1,365	920	445
Rail	968	1,179	(1,475)	1,377	(2,852)
	6,968	1,478	3,711	5,877	(2,166)
Others	1,113	48	620	691	(71)
	8,081	1,526	4,331	6,568	(2,237)
December 1971, £s million					*Loss (Profit)*
Coal	2,326	651	(284)	1,077	1,361
Electricity	5,404	—	2,773	3,222	449
Gas	1,589	—	493	1,020	527
Post Office	2,237	—	1,875	1,342	(533)
Rail	2,164	2,873	(3,458)	2,389	5,847
	13,720	3,524	1,399	9,050	7,651
Others	1,911	112	288	956	668
	15,631	3,636*	1,687	10,006	8,319

* = 62£2,300

separately from the Electricity Council, and are therefore included in 'Others' and not in 'Electricity'.

An accounting change in the year ending 31 March 1968, increased reserves by $_{c}$£85 million.

Gas

The first accounts cover the year ending 31 March 1950, starting one year later than most of the other nationalised industries. This article does not show detailed figures for Gas, which are the same as those in my earlier article in *The Accountant* of 7 May 1970, except for minor changes to the adjusted figures for the years ended 31 March 1954, and 1969, and the inclusion of results for the two latest years, ending on 31 March 1970 and 1971.

As noted in the article referred to, certain write-offs in the published accounts directly against obsolescence reserves have been treated as losses in both 'reported' and 'adjusted' figures.

Post Office

From the year ended 31 March 1957 onwards, the Post Office has charged extra amounts against profits in addition to conventional depreciation. These amounts, credited to a special reserve account in the conventional accounts, totalled $_{c}$£303 million by 31 March 1971. There is, of course, no equivalent item in the adjusted accounts; but (apart from the first few years) the extra charge each year almost exactly matches the difference between normal conventional depreciation and adjusted depreciation. The reported figures, however, still understate losses on disposal of fixed assets. In 1971 the extra depreciation of $_{c}$£37 million (28·5 per cent of normal conventional depreciation of $_{c}$£130 million) reduced profit before interest from $_{c}$£193 million (7·2 per cent of average assets) to $_{c}$£156 million (5·8 per cent).

Rail

There were two major capital reconstructions during the period, at the end of 1962 and at the beginning of 1969. Details are shown in separate statements in Appendix 6, both on a conventional and on an adjusted basis. The 1962 reconstruction did three things. It transferred away from the former British Transport Commission assets subsequently allocated to London Transport, British Waterways, British Transport Docks, and the Transport Holding Company totalling $_{c}$£404 million ($_{62}$£540 million) – about one quarter of the total. These are included in 'Others' from 1963. The 1962 reconstruction also reduced the capital by $_{c}$£879 million ($_{62}$£1,012 million) past accumulated losses, and established a capital deficit account of $_{c}$£296 million ($_{62}$£508 million) in respect of 'special write-offs' of assets. The 1969

TABLE 3
Capital reconciliation

	Current, £s million					*January 1962, £s million*					*December 1971, £s million*				
	A +	B +	C =	D +	E	A +	B +	C =	D +	E	A +	B +	C =	D +	E
Coal	312	758	4	667	407	569	848	21	577	861	900	1,341	32	912	1,361
Electricity	484	3,815	84	5,026	(643)	823	3,825	49	4,413	284	1,301	6,047	78	6,977	449
Gas	232	1,566	(3)	1,800	(5)	381	1,416	18	1,482	333	602	2,239	29	2,343	527
Post Office	268	1,812	315	2,840	(445)	483	1,638	16	2,474	(337)	763	2,590	25	3,911	(533)
Rail	1,217	2,495	(448)	412	2,852	2,111	2,545	(609)	349	3,698	3,338	4,024	(963)	552	5,847
	2,513	10,446	(48)	10,745	2,166	4,367	10,272	(505)	9,295	4,839	6,904	16,241	(799)	14,695	7,651
Others	1,138	1,456	477	3,000	71	994	1,331	655	2,557	423	1,572	2,104	1,035	4,043	668
	3,651	11,902	429	13,745	2,237	5,361	11,603	150	11,852	5,262	8,476	18,345	236	18,738	8,319
Adjustments:															
Electricity 1968			85					69					109		
PO Depreciation			303												
Steel, investment grants			55					40					63		
Miscellaneous			(14)					41					64		

A (Opening assets) + B (Capital introduced) + C (Adjustments) = D (Closing assets) + E (Losses) reconstruction involved a 'special write-off' of $_{c}$£883 million ($_{62}$£1,309 million) – about two-thirds of assets – mainly reducing the amount of fixed assets, but also setting up provisions for pensions and obsolescence. The reconstruction reduced capital by a larger amount, but at the same time cancelled the capital deficit account (somewhat increased since 1962).

After the second reconstruction, British Rail actually reported *profits* after interest in 1969 and 1970 of $_{c}$£15 million and $_{c}$£10 million respectively, though these were after including grants of about $_{c}$£75 million in each year (mainly for 'unremunerative passenger services'). Adjusted profits in 1969 and 1970 were *larger* than the reported profits, because a substantial balance of net monetary liabilities result in a monetary *gain* from currency debasement adjustments. The two capital reconstructions have so substantially reduced the fixed assets that these monetary gains at the moment far outweigh the depreciation understatements in conventional accounts.

For the six years from 1963 to 1968 inclusive, $_{c}$£705 million of British Rail capital was 'suspended' and bore no interest. This capital was subsequently cancelled in the 1969 reconstruction. An interest charge of $6\frac{3}{4}$ per cent per annum (the average rate on interest-bearing capital for the six years) would have increased the loss after interest by some $_{c}$£47 million per annum, a total of $_{c}$£282 million over the six years. On the other hand, if the two capital reconstructions had been combined at the end of 1962, then British Rail – with substantial grants included in revenue, and with smaller depreciation charges and with much smaller interest charges – might well have reported profits after interest since 1962. Thus reported figures need to be interpreted with some care, even apart from the substantial differences made by currency debasement adjustments.

BOAC

A capital reorganisation in 1966 wrote off $_{c}$£113 million, $_{c}$£65 million accumulated past losses and $_{c}$£48 million ($_{62}$£71 million) 'special write-offs'. Part of the capital became 'public dividend capital' from 1966, bearing no interest. By 1971, the capital consisted of $_{c}$£65 million 'public dividend capital', $_{c}$£80 million reserves, and $_{c}$£75 million foreign loans.

British Steel Corporation

Steel was nationalised from 1967, and the consolidation includes only four accounting periods: the years ending September, 1968 and 1969, the half-year ending March 1970, and the year ending March 1971.

At March 1971, $_{c}$£700 million of capital was 'public dividend capital', bearing no interest, and $_{c}$£380 million was interest-bearing debt. No 'public dividend' has been paid. In the $3\frac{1}{2}$ years since nationalisation, Steel has reported profits before interest averaging $_{c}$£12 million per annum on assets averaging $_{c}$£1,078 million ($_{62}$£12 million *loss* on $_{62}$£878 million). Six and a half per cent per annum interest on the £700 million 'public dividend capital' would have increased reported losses after interest by $_{c}$£45 million per annum, in total from $_{c}$£44 million to $_{c}$£201 million.

The consolidated accounts do not include the recently-proposed $_{c}$£350 million write-off.

British Transport Docks Board

Since separation from the British Transport Commission on 31 December 1962, an additional depreciation charge has been made to allow for changes in the purchasing power of money. In 1970 the additional charge represented 24 per cent of the conventional charge. A note to the published 1970 accounts giving details of the adjusted current purchasing power amounts for fixed assets shows an increase in net book amounts of more than $_{c}$£33 million over conventional reported amounts at 31 December 1970, an increase of 27 per cent. In view of the size of this difference, it seems unnecessary for the otherwise enlightened accounts to show figures to the nearest £1!

London Transport

On 1 January 1970, most of the London Transport Board's assets were transferred to the London Transport Executive, with control transferred from the Minister of Transport to the Greater London Council. The consolidation includes 1970 results, with two major differences from earlier years: the revaluation as at 1 January 1970, of all depreciable fixed assets, and the 'writing-off of interest-bearing debt of $_{c}$£270 million (which becomes interest-free 'corporate capital' in the 1970 accounts).

Details of the particular indices used to make adjustments are given in my May 1971 article in *The Investment Analyst**, and are not repeated here. Although it naturally takes considerable time to adjust even a single company's accounts for a period of 20 years, once that has been done and suitable cumulatively-adjusted figures are available it takes very little time indeed (perhaps one hour) to adjust each subsequent year's figures. Thus it would be perfectly possible to build up a 'portfolio' of adjusted accounts which would enable an analyst to prepare adjusted figures for all the companies in his 'portfolio' very quickly every year. Indeed some companies (Marks and Spencer, for example) produce their annual accounts so soon after the year-end that there

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* 'Short cuts in adjusting accounts for currency debasement', *The Investment Analyst*, No. 29, May 1971.

TABLE 4
Consolidated nationalised industries – summarised accounts

Current, £ million

	1948	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Net monetary assets	156	65	22	(51)	13	48	6	56	45	82	110	135
Net fixed assets	2,294	2,675	2,914	3,127	3,368	3,706	4,079	4,421	4,770	5,210	5,674	6,206
Other assets	64	58	58	43	44	38	35	34	31	29	26	30
	2,514	2,798	2,994	3,119	3,425	3,792	4,120	4,511	4,846	5,321	5,810	6,371
Government capital	2,535	2,818	3,009	3,136	3,434	3,783	4,102	4,534	4,856	5,368	5,936	6,536
Reserves	(21)	(20)	(15)	(17)	(9)	9	18	(23)	(10)	(47)	(126)	(165)
Depreciation	87	109	119	129	146	164	176	189	221	240	263	290
Profit before interest	92	97	113	113	127	155	153	119	153	153	144	189
Interest charged	84	96	102	107	116	133	143	155	174	200	228	259
Profit (loss) after interest	8	1	11	6	11	22	10	(36)	(21)	(47)	(84)	(70)
PBI/Assets (%)	3·7	3·7	3·9	3·7	3·9	4·3	3·9	2·8	3·3	3·0	2·6	3·1

Current, £ million

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*
Net monetary assets	167	115	60	(60)	(76)	(148)	(160)	310	475	232	214
Net fixed assets	6,670	7,109	7,571	7,858	8,566	9,228	10,078	11,659	12,408	12,324	13,134
Other assets	32	37	44	120	128	141	145	237	267	294	397
	6,869	7,261	7,675	7,918	8,618	9,221	10,063	12,206	13,150	12,850	13,745
Foreign debt							1	7	28	98	194
Government capital	7,111	7,672	8,193	7,712	8,283	8,327	9,121	11,164	11,902	11,133	11,864
Reserves	(242)	(411)	(518)	206	335	894	941	1,035	1,220	1,619	1,687
Depreciation	318	349	377	434	464	486	526	567	735	848	844
Profit before interest	182	138	220*	334	360	368**	375	419	559	688*	606
Interest charged	289	321	350	335	359	370	420	486	573	609	659
Profit (loss) after interest	(107)	(183)	(130)*	(1)	1	(2)**	(45)	(67)	(14)	79*	(53)
Special write-offs (=losses)			Rail 296			Coal 299 BOAC 48				Rail 883	
PBI/Assets (%)	2·7	2·0	2·9*	4·3	4·4	4·1**	3·9	3·8	4·4	5·3*	4·6

January 1962, £ million

	1948	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Net monetary assets	260	103	31	(71)	16	62	6	67	50	92	120	147
Net fixed assets	3,965	4,611	4,972	5,242	5,515	5,899	6,331	6,672	7,001	7,411	7,825	8,303
Other assets	109	99	99	73	75	65	60	58	53	49	44	47
	4,334	4,813	5,102	5,244	5,606	6,026	6,397	6,797	7,104	7,552	7,989	8,497
Government capital	4,364	4,864	5,161	5,341	5,718	6,164	6,562	7,085	7,452	8,021	8,634	9,276
Reserves	(30)	(51)	(59)	(97)	(112)	(138)	(165)	(288)	(348)	(469)	(645)	(779)
Depreciation	150	184	201	216	237	260	277	291	304	323	349	388
Monetary loss (gain)	6	6	4	(2)	(1)	(2)	2	2	2	2	2	—
Profit before interest	142	142	157	128	124	151	135	74	121	109	87	127
Interest charged	139	155	161	151	155	171	180	185	199	222	246	279
Loss (profit) after interest	(3)	13	4	23	31	20	45	111	78	113	159	152
PBI/Assets (%)	3·3	3·1	3·2	2·5	2·3	2·5	2·2	1·1	1·7	1·5	1·1	1·5

January 1962, £ million

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*
Net monetary assets	174	114	59	(59)	(70)	(129)	(139)	258	370	163	137
Net fixed assets	8,702	9,040	9,375	9,288	9,784	10,128	10,651	11,728	12,067	11,106	11,397
Other assets	47	50	55	127	133	142	149	221	239	247	318
	8,923	9,204	9,489	9,356	9,847	10,141	10,661	12,207	12,676	11,516	11,852
Foreign debt							1	6	21	71	130
Government capital	9,885	10,457	10,968	10,269	10,796	10,319	10,988	12,685	13,285	11,532	12,035
Reserves	(962)	(1,253)	(1,479)	(913)	(949)	(178)	(328)	(484)	(630)	(87)	(313)
Depreciation	415	443	473	542	565	572	598	639	799	857	804
Monetary loss (gain)	4	7	2	—	(3)	(5)	(4)	2	19	17	16
Profit before interest	112	46	108*	195	203	184**	171	172	204	283*	192
Interest charged	307	327	343	324	334	327	358	405	452	457	452
Loss after interest	195	281	235*	129	131	143**	187	233	248	174*	260
Special write-offs (=losses)			Rail 508			Coal 412 BOAC 71				Rail 1,309	
PBI/Assets (%)	1·3	0·5	1·2*	2·1	2·1	1·8**	1·7	1·5	1·6	2·3*	1·6

December 1971, £ million	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Net monetary assets	411	163	49	(123)	25	98	10	106	79	145	190	233
Net fixed assets	6,269	7,290	7,861	8,288	8,719	9,326	10,009	10,548	11,068	11,717	12,371	13,127
Other assets	172	156	156	116	119	103	95	92	84	78	69	74
	6,852	7,609	8,066	8,291	8,863	9,527	10,114	10,746	11,231	11,940	12,630	13,434
Government capital	6,899	7,690	8,159	8,444	9,040	9,745	10,375	11,201	11,781	12,681	13,650	14,665
Reserves	(47)	(81)	(93)	(153)	(177)	(218)	(261)	(455)	(550)	(741)	(1,020)	(1,231)
Depreciation	237	291	318	341	375	411	438	460	481	511	552	613
Monetary loss (gain)	9	9	6	(3)	(2)	(3)	3	3	3	3	3	—
Profit before interest	225	225	248	202	196	239	213	117	191	172	138	201
Interest charged	220	245	254	239	245	270	284	292	314	351	389	441
Loss after interest	(5)	20	6	37	49	31	71	175	123	179	251	240
PBI/Assets (%)	3·3	3·1	3·2	2·5	2·3	2·5	2·2	1·1	1·7	1·5	1·1	1·5

December 1971, £ million	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970=23 years	
Net monetary assets	275	180	93	(93)	(111)	(204)	(220)	408	585	258	216	
Net fixed assets	13,758	14,292	14,822	14,684	15,469	16,012	16,839	18,542	19,078	17,559	18,019	
Other assets	74	79	87	201	210	225	236	349	378	390	503	
	14,107	14,551	15,002	14,792	15,568	16,033	16,855	19,299	20,041	18,207	18,738	
Foreign debt							2	9	33	112	206	
Government capital	15,628	16,532	17,340	16,235	17,068	16,314	17,372	20,055	21,004	18,232	19,027	
Reserves	(1,521)	(1,981)	(2,338)	(1,443)	(1,500)	(281)	(519)	(765)	(996)	(137)	(495)	
Depreciation	656	700	748	857	893	904	945	1,010	1,263	1,355	1,271	15,630
Monetary loss (gain)	6	11	3	—	(5)	(8)	(6)	3	30	27	25	117
Profit before interest	177	73	171*	308	321	291**	270	272	323	447*	304	5,324
Interest charged	485	517	542	512	528	517	566	640	715	722	715	10,003
Loss after interest	308	444	371*	204	207	226**	296	368	392	275*	411	4,679
Special write-offs (=losses)			Rail 803			Coal 651 BOAC 112				Rail 2,070		3,636
● PBI/Assets (%)	1·3	0·5	1·2*	2·1	2·1	1·8**	1·7	1·5	1·6	2·3*	1·6	

* Before special write-off.
** Before special write-offs.

would be a slight delay while one waited for the most recent month's Retail Price Index to be published!

It should be mentioned that fixed asset adjustments for Coal and Rail were made in more detail than is published here, distinguishing respectively Mines and Buildings from Plant and Machinery and Ways and Structures from Rolling Stock and Plant. Obviously the more precisely one can categorise classes of fixed asset the more accurate one's adjustments will be. Any criticism of the 'accuracy' of adjustments, however, must be made in the context of a depreciation understatement of approximately 36 per cent in 1970 (=$_{70}$£300 million) shown by adjusted figures, and must also allow for the inevitably approximate nature of depreciation charges even when the value of money is more or less stable.

Adjustments in detail

Electricity figures will illustrate currency debasement adjustments in detail. The same procedure as that used to adjust gas industry accounts* has been used for all industries.

To adjust fixed assets one must identify additions, depreciation charges, and cost and accumulated depreciation on disposals. Fixed assets on hand at April 1948 ($_{c}$£800 million cost less $_{c}$£427 million depreciation) were assumed acquired in March 1948, when the Retail Price Index (linked backwards from January 1962=100·0) was 58·8. Thus the adjusted cost of fixed assets at April 1948 amounted to $_{62}$£1,361 million, and accumulated depreciation to $_{62}$£726 million (i.e. 800/58·8 and 427/58·8 respectively). Additions in the year to March 1949 ($_{c}$£126 million), assumed acquired evenly throughout the year, were converted by the average retail price index for the year ended March 1949 (60·2), which gave adjusted additions for the year of $_{62}$£209 million.

Electricity fixed assets have been written off over about 30 years (on the straight-line basis). If the average fixed asset life were exactly 30 years, the conventional annual depreciation charge would be exactly one-thirtieth of the accumulated cost of fixed assets, and the adjusted depreciation charge would be exactly one-thirtieth of the adjusted accumulated cost. In the year to March 1949, conventional depreciation was $_{c}$£31 million (=1/30×$_{c}$£926 million) and adjusted depreciation was $_{62}$£52 million (=1/30×$_{62}$£1,570 million). Any difference between exactly one-thirtieth of cost and actual conventional depreciation has been added to (or deducted from) the adjusted depreciation charge without index conversion. Thus in the year to March 1950 conventional depreciation was $_{c}$£34 million, $_{c}$£1 million less than might have been expected (1/30×$_{c}$£1,040 million=$_{c}$£35 million), and adjusted depreciation is only $_{62}$£57 million, $_{62}$£1 million less than 1/30×$_{62}$£1,754 million (=$_{62}$£58 million).

Fixed assets are assumed to be disposed of on a FIFO basis. The index at the date of *acquisition* must therefore be used to convert both cost and accumulated depreciation on disposals, which requires keeping track of the accumulated costs of fixed assets disposed of. As a rule it has been assumed that proceeds of sale exactly equal conventional net book value, resulting in no conventional profit or loss on disposal. But the assumed proceeds have to be converted at the index for the year of *disposal*, which produces an adjusted *loss* on disposal, since the adjusted net book value is based on the index for the year of acquisition.

Disposals of electricity fixed assets have still not exhausted the assets on hand at April 1948, so disposals in the year to March 1971 ($_{c}$£32 million cost less $_{c}$£13 million accumulated depreciation) are converted at the assumed acquisition date index of 58·8 and adjusted disposals for the year to March 1971 are $_{62}$£54 million cost and $_{62}$£22 million depreciation. The proceeds are assumed to be $_{c}$£19 million, the conventional net book value (=$_{62}$£13 million when converted by 143·1, the average index for the year to March 1971). Thus the assumed nil conventional loss on sale ($_{c}$£19 million net book value less $_{c}$£19 million (assumed) proceeds) becomes an adjusted loss on sale of $_{62}$£19 million ($_{62}$£32 million net book value less $_{62}$£13 million proceeds). Profits or losses on disposals of fixed assets are really adjustments to previous years' depreciation charges, and this kind of depreciation adjustment affects even those businesses (like the Post Office) that try to charge the correct depreciation each year.

After the somewhat complicated adjustments for fixed assets, those for the profit and loss account are now relatively simple. Profit before depreciation and interest, and interest charged, are converted at the average index for the year concerned. Thus in the year to March 1959, conventional figures of $_{c}$£167 million and $_{c}$£60 million respectively are divided by the average index for the year of 93·1 to become adjusted figures of $_{62}$£179 million and $_{62}$£64 million respectively. The adjusted depreciation charge (and any adjusted loss on disposal of fixed assets) is taken from the fixed asset schedule, calculated as explained above.

Monetary assets and liabilities have been combined into a single 'net monetary assets' figure, converted by the index at March each year to provide the adjusted balance sheet figure. Thus the conventional net monetary assets figures at March 1970 and March 1971 ($_{c}$£90 million and $_{c}$£143 million respectively) are divided by the appropriate indexes (137·0 and 149·0)

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to give adjusted net monetary assets figures of $_{62}$£66 million and $_{62}$£96 million respectively. The average net monetary assets figure throughout the year is assumed to be the simple average of the two end-of-year figures – in this case $_{62}$£81 million – and the monetary *loss* is then that amount multiplied by the fall in the value of money during the period – in this case 8·1 per cent (137·0/149·0=91·9 per cent) – to give an adjusted monetary loss of $_{62}$£7 million (=8·1 per cent × $_{62}$£81 million). There is no conventional equivalent to this monetary loss (or gain if there is a balance of net monetary liabilities), since the value of money is conventionally assumed to be stable.

Of the balance sheet items, net monetary assets and net fixed assets have already been explained. Capital inflows, other assets, and foreign debt are carried forward each year, with changes in any year being converted by the average index for that year. Thus in the year to March 1969, the conventional increase in capital of $_{c}$£164 million becomes an adjusted increase of $_{62}$£129 million after being converted by the appropriate index, 126·9. There is no particular relationship between accumulated balances carried forward at the end of the year ($_{c}$£3,994 million and $_{62}$£4,407 million respectively). Changes in reserves are mainly adjusted profits and losses after interest, though there are some small unidentified differences, probably mostly due to rounding.

Appendix 2

Nationalised concerns *not* included in consolidation (with approximate assets in 1970)

	£ million
Atomic Energy Authority	230
British Airports Authority	75
British Broadcasting Corporation	70
Bank of England	115
Commonwealth Development Corporation	140
Forestry Commission	400
Industrial Re-organisation Corporation	85

Appendix 1

Accounts included in consolidation

Coal			
National Coal Board			
Years ended December 1948–62		15	
15 months ended March 1964		1	
Years ended March 1965–71		7	
		—	23
Electricity			
Electricity Council			
(Central Electricity Authority until December 1957)			
Years ended March 1949–71			23
Gas			
Gas Council			
Years ended March 1950–71			22
Post Office			
Post Office			
Years ended March 1949–71			23
Rail			
British Transport Commission			
Years ended December 1948–62		15	
British Railways Board			
Years ended December 1963–70		8	
		—	23
Others			
Airlines		46	
Scottish Electricity		52	
Steel		4	
Transport		38	
		—	140
			254
Details of 'Others			
Airlines			
British European Airways			
Years ended March 1949–71	23		
British Overseas Airways Corporation			
Years ended March 1949–71	23		
	—		46
Scottish Electricity			
North of Scotland Hydro-Electric Board			
Years ended December 1949–63	15		
15 months ended March 1965	1		
Years ended March 1966–71	6		
	—	22	
South East Scotland Electricity Board			
Years ended March 1949–55	7		
South West Scotland Electricity Board			
Years ended March 1949–55	7		
South of Scotland Electricity Board			
9 months ended December 1955	1		
Years ended December 1956–63	8		
15 months ended March 1965	1		
Years ended March 1966–71	6		
	—	30	
		—	52
Steel			
British Steel Corporation			
Years ended September 1968–69	2		
6 months ended March 1970	1		
Year ended March 1971	1		
	—		4
Transport			
British Transport Docks Board			
Years ended December 1963–70	8		
British Waterways Board			
Years ended December 1963–70	8		
London Transport Board			
Years ended December 1963–70	8		
Transport Holding Company			
Years ended December 1963–68	6		
10 months ended October 1969	1		
Year ended October 1970	1		
National Bus Corporation			
Years ended December 1969–70	2		
National Freight Corporation			
Years ended December 1969–70	2		
Scottish Transport Group			
Years ended December 1969–70	2		
	—		38
			140

Appendix 3

Coal. Conventional. Balance Sheets and Profit and Loss Accounts, 1947–71 (*c£ millions*)

	1947	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*
Balance Sheets												
Net monetary assets	48	54	52	49	38	33	25	10	20	(3)	23	90
Net fixed assets	264	271	281	288	295	321	415	510	566	618	672	723
	312	325	333	337	333	354	440	520	586	615	695	813
Capital	332	344	342	337	340	365	450	533	618	633	717	838
Accumulated losses	(23)	(22)	(12)	(4)	(6)	(14)	(13)	(17)	(36)	(23)	(29)	(33)
Reserves brought forward	—	3	3	3	4	(1)	3	3	4	4	5	7
change	3	—	—	1	(5)	4	—	1	—	1	2	1
	312	325	333	337	333	354	440	520	586	615	695	813
Profit and Loss Accounts												
Profit before depreciation	7	34	43	44	37	33	50	49	41	77	67	79
Depreciation	15	17	20	21	24	27	33	35	40	43	47	51
Profit before interest	(8)	17	23	23	13	6	17	14	1	34	20	28
Interest charged	15	16	13	15	15	14	16	18	20	21	26	32
Profit (loss) after interest	(23)	1	10	8	(2)	(8)	1	(4)	(19)	13	(6)	(4)
PBI/assets (%)	(2·7)	5·4	6·9	6·8	3·8	1·8	4·3	2·9	0·3	5·7	3·2	3·8

	1959	*1960*	*1961*	*1962*	*1964**	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Balance Sheets												
Net monetary assets	115	117	58	62	26	48	21	34	92	103	28	18
Investments							4	6	8	11	13	16
Net fixed assets	777	800	827	832	846	861	775	749	642	636	625	633
	892	917	885	894	872	909	800	789	742	750	666	667
Capital	941	974	958	963	927	960	990 (415)	613	695	718	668	675
Accumulated losses	(57)	(78)	(93)	(92)	(72) (12) (7)	(91)	(116) 116	—	—	(8)	(34)	(34)
Reserves brought forward	8	8	21	20	23	36	40	225	176	47	40	32
change—ordinary	—	13	(1)	3	1	4	(7)	3	—	(1)	(4)	(4)
special					12		415 (116) (107)	(52)	(129)	(6)	(4)	(2)
	892	917	885	894	872	909	800	789	742	750	666	667
Profit and Loss Accounts												
Profit before depreciation	69	80	91	121	161*	115	64	93	88	83	69	97
Depreciation	56	60	64	76	88*	72	64	65	54	54	60	62
Profit before interest	13	20	27	45	73*	43	—	28	34	29	9	35
Interest charged	37	41	42	44	53*	43	25	28	34	37	35	35
Profit (loss) after interest	(24)	(21)	(15)	1	20*	—	(25)	—	—	(8)	(26)	—
Add: Grants included above								1	8	15	11	11
Total loss								(1)	(8)	(23)	(37)	(11)
PBI/Assets (%)	1·5	2·2	3·0	5·1	6·6*	4·8	—	3·6	4·5	3·8	1·2	5·3

Coal, Conventional, Fixed Assets 1947–71 (*c£ millions*)

Fixed Assets	*1947*	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*
Cost												
Brought forward	260	279	303	333	361	392	445	572	578	655	733	818
Added in year	19	24	31	29	32	54	128	100	98	96	103	104
(Disposals)	—	—	(1)	(1)	(1)	(1)	(1)	(18) (76)	(21)	(18)	(18)	(19)
Carried forward	279	303	333	361	392	445	572	578	655	733	818	903
Depreciation												
Brought forward	—	15	32	52	73	97	124	157	68	89	115	146
Charged in year*	15	17	20	21	24	27	33	35	40	43	47	51
(Disposals)	—	—	—	—	—	—	—	(17) (107)	(19)	(17)	(16)	(17)
Carried forward	15	32	52	73	97	124	157	68	89	115	146	180
Net book value	264	271	281	288	295	321	415	510	566	618	672	723

* Based on a more detailed split of fixed assets. On the basis of total fixed assets, the rate of depreciation charged approximates 6 per cent of cost from 1947 to 1957, 5½ per cent of cost from 1958 to 1965, and 5 per cent of cost after 1965.

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Disposals—book value		—	1	1	1	1	1	1	2	1	2	2
proceeds		—	1	1	1	1	1	1	2	1	2	2

Fixed Assets	*1959*	*1960*	*1961*	*1962*	*1964**	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Cost												
Brought forward	903	995	1,060	1,131	1,190	1,260	1,320	1,256	1,245	1,152	1,150	1,160
Added in year	112	86	93	86	111	90	88	94	82	59	59	78
Disposals – ordinary	(20)	(21)	(22)	(27)	(41)	(30)	(45)	(53)	(46)	(55)	(45)	(37)
special							(107)	(52)	(129)	(6)	(4)	(2)
Carried forward	995	1,060	1,131	1,190	1,260	1,320	1,256	1,245	1,152	1,150	1,160	1,199
Depreciation												
Brought forward	180	218	260	304	358	414	459	481	496	510	514	535
Charged in year	56	60	64	76	88*	72	64	65	54	54	60	62
(Disposals)	(18)	(18)	(20)	(22)	(32)	(27)	(42)	(50)	(40)	(50)	(39)	(31)
Carried forward	218	260	304	358	414	459	481	496	510	514	535	566
Net book value	777	800	827	832	846	861	775	749	642	636	625	633
Disposals – book value	2	3	2	5	9	3	3	3	6	5	6	6
proceeds	2	3	2	5	9	3	3	3	6	5	6	6

Coal. Adjusted. Balance Sheets and Profit and Loss Accounts, 1947–71 (*$_{62}$£ millions*)

Balance Sheets	*1947*	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*
Net monetary assets	83	90	83	77	52	42	33	12	24	(3)	25	97
Net fixed assets	486	494	506	511	514	538	647	776	828	874	919	958
	569	584	589	588	566	580	680	788	852	871	944	1,055
Capital	613	633	630	622	626	659	769	874	977	994	1,088	1,219
Accumulated losses	(49)	(54)	(46)	(40)	(58)	(83)	(95)	(113)	(151)	(151)	(173)	(194)
Reserves brought forward	5	5	5	5	6	) (2)	4	6	27	26	28	29
change	—	—	—	1	(8)	6	2	21	(1)	2	1	1
	569	584	589	588	566	580	680	788	852	871	944	1,055
Profit and Loss Accounts												
Profit before depreciation	12	57	69	70	52	44	63	63	50	89	75	86
Depreciation	29	32	37	39	42	46	54	54	58	61	64	68
Loss on sale of fixed assets	—	—	—	—	—	1	—	4	4	3	3	3
Monetary losses	5	4	3	2	7	3	—	1	1	—	1	1
Profit before interest	(22)	21	29	29	3	(6)	9	4	(13)	25	7	14
Interest charged	27	26	21	23	21	19	21	22	25	25	29	35
Profit (loss) after interest	(49)	(5)	8	6	(18)	(25)	(12)	(18)	(38)	—	(22)	(21)
PBI/Assets (%)	(3·9)	3·7	5·0	4·8	0·6	(0·9)	1·1	0·6	(1·6)	2·8	0·8	1·3

Balance Sheets	*1959*	*1960*	*1961*	*1962*	*1964**	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Net monetary assets	124	122	59	61	25	43	18	29	75	79	21	12
Investments							3	5	7	9	11	13
Net fixed assets	999	1,008	1,018	1,004	994	988	818	760	610	590	565	552
	1,123	1,130	1,077	1,065	1,019	1,031	839	794	692	678	597	577
Capital	1,329	1,364	1,347	1,352	1,318	1,348	1,375 (825)	582	650	668	631	636
Accumulated losses	(236)	(277)	(313)	(332)	(339) (13) (7)	(376)	(412) 412	(14)	(26)	(50)	(87)	(106)
Reserves brought forward	30	30	43	43	45	60	59	289	226	68	60	53
change – ordinary	—	13	—	2	2	(1)	(8)	4	—	—	(2)	(4)
special					13		825 (412) (175)	(67)	(158)	(8)	(5)	(2)
	1,123	1,130	1,077	1,065	1,019	1,031	839	794	692	678	597	577
Profit and Loss Accounts												
Profit before depreciation	74	85	94	119	154*	110	57	79	73	63	52	68
Depreciation	72	76	79	90	100*	83	69	67	53	52	58	58
Loss on sale of fixed assets	4	4	4	4	9	3	1	1	2	2	3	4
Monetary losses	—	2	4	1	1	1	1	1	2	4	2	1
Profit before interest (loss)	(2)	3	7	24	44*	23	(14)	10	16	5	(11)	5
Interest charged	40	44	43	43	51*	40	22	24	28	29	26	24
Loss after interest	42	41	36	19	7*	17	36	14	12	24	37	19
Add: Grants included above								1	6	11	8	8
							Total loss	15	18	35	45	27
PBI/Assets (%)	(0·2)	0·2	0·6	2·2	3·4	2·2	(1·5)	1·2	2·2	0·7	(1·7)	1·0

Coal. Adjusted. Fixed Assets, 1947–71 (*${}_{62}$£ millions*)

Fixed Assets	*1947*	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*
Cost												
Brought forward	482	515	555	604	648	693	763	926	878	957	1,035	1,118
Added in year	33	40	51	46	47	72	165	126	117	111	115	112
(Disposals)	—	—	(2)	(2)	(2)	(2)	(2)	(34) (140)	(38)	(33)	(32)	(33)
Carried forward	515	555	604	648	693	763	926	878	957	1,035	1,118	1,197
Depreciation												
Brought forward	—	29	61	98	137	179	225	279	102	129	161	199
Charged in year	29	32	37	39	42	46	54	54	58	61	64	68
(Disposals)	—	—	—	—	—	—	—	(29) (202)	(31)	(29)	(26)	(28)
Carried forward	29	61	98	137	179	225	279	102	129	161	199	239
Net book value	486	494	506	511	514	538	647	776	828	874	919	958
Disposals – book value	—	—	2	2	2	2	2	5	7	4	6	5
proceeds	—	—	2	2	2	1	2	1	3	1	3	2
Loss on sale of fixed assets	—	—	—	—	—	1	—	4	4	3	3	3
Fixed Assets	*1959*	*1960*	*1961*	*1962*	*1964**	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Cost												
Brought forward	1,197	1,281	1,335	1,392	1,432	1,474	1,512	1,356	1,302	1,158	1,133	1,122
Added in year	120	91	96	85	107	83	78	80	68	46	45	55
Disposals – ordinary	(36)	(37)	(39)	(45)	(65)	(45)	(59)	(67)	(54)	(63)	(51)	(42)
special							(175)	(67)	(158)	(8)	(5)	(2)
Carried forward	1,281	1,335	1,392	1,432	1,474	1,512	1,356	1,302	1,158	1,133	1,122	1,133
Depreciation												
Brought forward	239	282	327	374	428	480	524	538	542	548	543	557
Charged in year	72	76	79	90	100*	83	69	68	53	52	58	58
(Disposals)	(29)	(31)	(32)	(36)	(48)	(39)	(55)	(64)	(47)	(57)	(44)	(34)
Carried forward	282	327	374	428	480	524	538	542	548	543	557	581
Net book value	999	1,008	1,018	1,004	994	988	818	760	610	590	565	552
Disposals – book value	7	6	7	9	17	6	4	3	7	6	7	8
proceeds	3	2	3	5	8	3	3	2	5	4	4	4
Loss on sale of fixed assets	4	4	4	4	9	3	1	1	2	2	3	4

*15 months period ending 31.3.64

Appendix 4

Electricity. Conventional. Balance Sheets and Profit and Loss Accounts, 1949–71 (*c£ millions*)

Balance Sheets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Net monetary assets	47	95	14	63	(40)	(2)	16	(6)	47	65	31	12
Goodwill, etc.	64	64	58	58	43	44	38	35	34	31	29	26
Net fixed assets	373	468	548	637	735	840	954	1,095	1,179	1,314	1,474	1,642
	484	627	620	758	738	882	1,008	1,124	1,260	1,410	1,534	1,680
Capital	484	623	608	740	717	854	967	1,064	1,189	1,327	1,435	1,554
Reserves brought forward	—	—	4	12	18	21	28	41	60	71	83	99
profit	—	4	7	6	3	7	13	19	12	12	16	27
difference			1						(1)			
	484	627	620	758	738	882	1,008	1,124	1,260	1,410	1,534	1,680
Profit and Loss Accounts												
Profit before depreciation and interest		51	59	63	65	78	95	109	108	122	139	167
Depreciation		31	34	36	39	43	49	54	56	63	69	80
Profit before interest		20	25	27	26	35	46	55	52	59	70	87
Interest charged		16	18	21	23	28	33	36	40	47	54	60
Profit after interest		4	7	6	3	7	13	19	12	12	16	27
PBI/Assets (%)		3·6	4·0	3·9	3·5	4·3	4·9	5·2	4·4	4·4	4·8	5·4
Balance Sheets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Net monetary assets	8	(12)	(5)	(21)	(42)	(69)	(99)	(132)	(16)	43	90	143
Goodwill, etc.	24	22	19	16	13	12	10	7	5	—	—	—
Nuclear power	6	10	18	28	47	55	60	61	58	63	70	82
Net fixed assets	1,850	2,030	2,229	2,467	2,788	3,184	3,588	4,038	4,401	4,607	4,721	4,801
	1,888	2,050	2,261	2,490	2,806	3,182	3,559	3,974	4,448	4,713	4,881	5,026

Foreign loans

Capital	1,735	1,881	2,065	2,252	2,497	2,810	3,102	3,496	3,830	3,994	4,077	4,263
Reserves brought forward	126	153	169	196	238	309	372	457	478	618	719	783
profit	27	16	27	43	70	64	85	21	55	101	64	(56)
difference				(1)	1	(1)			85			
	1,888	2,050	2,261	2,490	2,806	3,182	3,559	3.974	4,448	4,713	4,881	5,026
Profit and Loss Accounts												
Profit before depreciation and interest	188	198	232	273	322	349	413	395	481	574	567	481
Depreciation	93	104	112	127	138	156	177	198	223	251	261	276
Profit before interest	95	94	120	146	184	193	236	197	258	323	306	205
Interest charged	68	78	93	103	114	129	151	176	203	222	242	261
Profit (loss) after interest	27	16	27	43	70	64	85	21	55	101	64	(56)
PBI/Assets (%)	5·3	4·8	5·6	6·1	6·9	6·4	7·0	5·2	6·1	7·1	6·4	4·1

Electricity. Conventional. Fixed Assets, 1949–71 (c£ *million*)

Fixed Assets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Cost												
Brought forward		800	926	1,040	1,164	1,292	1,437	1,600	1,794	1,885	2,082	2,313
Added in year		126	114	125	137	148	163	195	140	198	229	248
(Disposals)		—	—	(1)	(9)	(3)	—	(1)	(49)	(1)	2	(5)
Carried forward	800	926	1,040	1,164	1,292	1,437	1,600	1,794	1,885	2,082	2,313	2,556
Depreciation												
Brought forward		427	458	492	527	557	597	646	699	706	768	839
Charged in year*		31	34	36	39	43	49	54	56	63	69	80
(Disposals)		—	—	(1)	(9)	(3)	—	(1)	(49)	(1)	2	(5)
Carried forward	427	458	492	527	557	597	646	699	706	768	839	914
Net book value	373	468	548	637	735	840	954	1,095	1,179	1,314	1,474	1,642
Cost/30 year life =		31	35	39	43	48	53	60	63	69	77	85
		—	−1	−3	−4	−5	−4	−6	−7	−6	−8	−5

Fixed Assets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Cost												
Brought forward	2,556	2,854	3,135	3,440	3,797	4,249	4,790	5,363	6,001	6,570	7,007	7,360
Added in year	311	295	322	373	469	562	592	660	599	469	392	375
(Disposals)	(13)	(14)	(17)	(16)	(17)	(21)	(19)	(22)	(30)	(32)	(39)	(32)
Carried forward	2,854	3,135	3,440	3,797	4,249	4,790	5,363	6,001	6,570	7,007	7,360	7,703
Depreciation												
Brought forward	914	1,004	1,105	1,211	1,330	1,461	1,606	1,775	1,963	2,169	2,400	2,639
Charged in year	93	104	112	127	138	156	177	198	223	251	261	276
(Disposals)	(3)	(3)	(6)	(8)	(7)	(11)	(8)	(10)	(17)	(20)	(22)	(13)
Carried forward	1,004	1,105	1,211	1,330	1,461	1,606	1,775	1,963	2,169	2,400	2,639	2,902
Net book value	1,850	2,030	2,229	2,467	2,788	3,184	3,588	4,038	4,401	4,607	4,721	4,801
Cost/30 year life	95	104	115	127	142	160	179	200	219	234	245	257
	−2	—	−3	—	−4	−4	−2	−2	+4	+17	+16	+19
Disposals – book value	10	11	11	8	10	10	11	12	13	12	17	19
proceeds	10	11	11	8	10	10	11	12	13	12	17	19

Electricity. Adjusted. Balance Sheets and Profit and Loss Accounts, 1949–71 ($_{62}$£ *million*)

Balance Sheets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Net monetary assets	79	157	22	95	(54)	(3)	20	(7)	55	73	34	13
Goodwill, etc.	109	109	99	99	73	75	65	60	58	53	49	44
Net fixed assets	635	792	919	1,052	1,178	1,300	1,429	1,586	1,664	1,794	1,944	2,096
	823	1,058	1,040	1,246	1,197	1,372	1,514	1,639	1,777	1,920	2,027	2,153
Capital	800	1,030	1,006	1,212	1,180	1,346	1,491	1,612	1,760	1,918	2,037	2,165
Reserves brought forward	23	23	28	34	34	17	26	23	27	17	2	(10)
profit (loss)	—	4	6	—	(9)	(6)	—	4	(9)	(13)	(10)	1
difference	—	1	—	—	(8)	15	(3)	—	(1)	(2)	(2)	(3)
	823	1,058	1,040	1,246	1,197	1,372	1,514	1,639	1,777	1,920	2,027	2,153
Profit and Loss Accounts												
Profit before depreciation and interest		85	95	98	92	102	122	136	128	139	153	179
Depreciation		52	57	62	67	72	80	86	88	96	102	114
Monetary losses (gains)		2	3	3	2	(1)	—	1	2	2	2	—
Profit before interest		31	35	33	23	31	42	49	38	41	49	65
Interest charged		27	29	33	32	37	42	45	47	54	59	64
Profit (loss) after interest		4	6	—	(9)	(6)	—	4	(9)	(13)	(10)	1
PBI/Assets (%)		3·3	3·3	2·9	1·9	2·4	2·9	3·1	2·2	2·2	2·5	3·1

Balance Sheets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Net monetary assets	9	(12)	(5)	(20)	(40)	(63)	(86)	(111)	(13)	33	66	96
Goodwill, etc.	41	37	32	27	22	20	17	12	9	—	—	—
Nuclear power	6	10	18	28	46	53	57	58	56	60	65	73
Net fixed assets	2,285	2,439	2,601	2,792	3,056	3,371	3,671	3,990	4,222	4,306	4,298	4,244
	2,341	2,474	2,646	2,827	3,084	3,381	3,659	3,949	4,274	4,399	4,429	4,413
Foreign debt											21	36
Capital	2,359	2,513	2,699	2,882	3,118	3,407	3,665	4,000	4,278	4,407	4,077	4,263
Reserves brought forward	(12)	(18)	(39)	(53)	(55)	(34)	(26)	(6)	(51)	(4)	(8)	(56)
profit (loss)	(5)	(19)	(12)	—	22	10	22	(44)	(22)	(1)	(47)	(156)
difference	(1)	(2)	(2)	(2)	(1)	(2)	(2)	(1)	69	(3)	(1)	—
	2,341	2,474	2,646	2,827	3,084	3,381	3,659	3,949	4,274	4,399	4,429	4,413
Profit and Loss Accounts												
Profit before depreciation and interest	202	209	235	267	310	322	365	336	400	452	425	336
Depreciation	128	140	146	161	171	187	205	223	244	267	274	284
Loss on sale of fixed assets	6	6	7	5	7	8	8	10	11	10	15	19
Monetary loss (gain)	—	—	—	—	—	(2)	(3)	(3)	(2)	1	2	7
Profit before interest	68	63	82	101	132	129	155	106	147	174	134	26
Interest charged	73	82	94	101	110	119	133	150	169	175	181	182
Profit (loss) after interest	(5)	(19)	(12)	—	22	10	22	(44)	(22)	(1)	(47)	(156)
PBI/Assets (%)	3·0	2·6	3·2	3·7	4·5	4·0	4·4	2·8	3·6	4·0	3·0	0·6

Electricity. Adjusted. Fixed Assets, 1949–59 (*£ million*)

Fixed Assets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Cost												
Brought forward		1,361	1,570	1,754	1,947	2,125	2,314	2,523	2,764	2,847	3,071	3,326
Added in year		209	184	195	193	194	209	243	166	226	252	266
(Disposals)		—	—	(2)	(15)	(5)	—	(2)	(83)	(2)	3	(9)
Carried forward	1,361	1,570	1,754	1,947	2,125	2,314	2,523	2,764	2,847	3,071	3,326	3,583
Depreciation												
Brought forward		726	778	835	895	947	1,014	1,094	1,178	1,183	1,277	1,382
Charged in year		52	57	62	67	72	80	86	88	96	102	114
(Disposals)		—	—	(2)	(15)	(5)	—	(2)	(83)	(2)	3	(9)
Carried forward	726	778	835	895	947	1,014	1,094	1,178	1,183	1,277	1,382	1,487
Net book value	635	792	919	1,052	1,178	1,300	1,429	1,586	1,664	1,794	1,944	2,096
Cost/30 year life		52	58	65	71	77	84	92	95	102	110	119
		—	−1	−3	−4	−5	−4	−6	−7	−6	−8	−5

Fixed Assets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Cost												
Brought forward	3,583	3,895	4,184	4,482	4,820	5,243	5,726	6,217	6,742	7,190	7,507	7,737
Added in year	334	312	326	365	452	519	523	562	498	370	294	262
(Disposals)	(22)	(23)	(28)	(27)	(29)	(36)	(32)	(37)	(50)	(53)	(64)	(54)
Carried forward	3,895	4,184	4,482	4,820	5,243	5,726	6,217	6,742	7,190	7,507	7,737	7,945
Depreciation												
Brought forward	1,487	1,610	1,745	1,881	2,028	2,187	2,355	2,546	2,752	2,968	3,201	3,439
Charged in year	128	140	146	161	171	187	205	223	244	267	274	284
(Disposals)	(5)	(5)	(10)	(14)	(12)	(19)	(14)	(17)	(28)	(34)	(36)	(22)
Carried forward	1,610	1,745	1,881	2,028	2,187	2,355	2,546	2,752	2,968	3,201	3,439	3,701
Net book value	2,285	2,439	2,601	2,792	3,056	3,371	3,671	3,990	4,222	4,306	4,298	4,244
Cost/30 year life	130	140	149	161	175	191	207	225	240	250	258	265
	−2	—	−3	—	−4	−4	−2	−2	+4	+17	+16	+19
Disposals – book value	17	18	18	13	17	17	18	20	22	19	28	32
proceeds	11	12	11	8	10	9	10	10	11	9	13	13
Loss on sale of fixed assets	6	6	7	5	7	8	8	10	11	10	15	19

Appendix 5

Post Office. Conventional. Balance Sheets and Profit and Loss Accounts, 1948–71 (c£ *million*)

Balance Sheets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Net monetary assets	18	22	25	25	24	26	29	30	35	41	47	41
Net fixed assets	250	265	287	307	335	374	417	461	515	601	666	726
	268	287	312	332	359	400	446	491	550	642	713	767
Capital	268	287	312	332	359	400	446	491	550	607	661	699
Retained profits										(3)	—	9
Extra depreciation										17	34	51
Reserves										21	18	8
										642	713	767
Profit and Loss Accounts												
Profit before depreciation	45	42	44	45	38	41	48	50	50	70	83	95
Depreciation – ordinary	17	18	20	22	22	24	27	29	31	28	32	35
extra										17	17	17
Profit before interest	28	24	24	23	16	17	21	21	19	25	34	43
Interest charged	9	9	10	10	11	12	14	16	17	23	26	29
Profit after interest	19	15	14	13	5	5	7	5	2	2	8	14
Paid to Exchequer	19	15	14	13	5	5	7	5	2	5	5	5
Retained profit	—	—	—	—	—	—	—	—	—	(3)	3	9
PBI/Assets (%)	10·8	8·6	8·0	7·1	4·6	4·5	5·0	4·5	3·6	4·2	4·4	5·8

Balance Sheets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Net monetary assets	65	90	78	57	59	55	66	70	95	143	68	50
Net fixed assets	802	870	950	1,033	1,145	1,274	1,420	1,612	1,849	2,111	2,453	2,790
	867	960	1,028	1,090	1,204	1,329	1,486	1,682	1,944	2,254	2,521	2,840
Eurodollar loan												8
Capital	742	791	831	866	931	1,016	1,111	1,241	1,441	1,681	1,910	2,163
Retained profits	30	54	67	79	110	130	170	215	254	298	334	355
Extra depreciation	65	80	95	109	127	148	169	190	213	239	266	303
Reserves	30	35	35	36	36	35	36	36	36	36	11	11
	867	960	1,028	1,090	1,204	1,329	1,486	1,682	1,944	2,254	2,521	2,840
Profit and Loss Accounts												
Profit before depreciation	109	117	108	113	142	144	177	200	215	250	287	323
Depreciation – ordinary	38	41	45	49	52	57	64	74	81	92	112	130
extra	14	15	15	14	18	21	21	21	23	26	27	37
Profit before interest	57	61	48	50	72	66	92	105	111	132	148	156
Interest charged	31	32	35	38	41	46	52	60	72	88	112	136
Profit after interest	26	29	13	12	31	20	40	45	39	44	36	20
Paid to Exchequer	5	5										
Retained profit	21	24										
PBI/Assets (%)	7·0	6·7	4·8	4·7	6·3	5·2	6·6	6·6	6·1	6·3	6,2	5·8

Post Office. Conventional. Fixed Assets, 1948–71 (c£ *million*)

Fixed Assets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Cost												
Brought forward	360	392	415	446	477	513	563	618	675	744	865	949
Added in year	32	33	42	42	50	63	70	73	85	114	97	95
(Disposals)	—	(10)	(11)	(11)	(14)	(13)	(15)	(16)	(16)	7	(13)	(14)
Carried forward	392	415	446	477	513	563	618	675	744	865	949	1,030
Depreciation												
Brought forward	125	142	150	159	170	178	189	201	214	229	264	283
Charged in year*	17*	18	20	22	22	24	27	29	31	28	32	35
(Disposals)	—	(10)	(11)	(11)	(14)	(13)	(15)	(16)	(16)	7	(13)	(14)
Carried forward	142	150	159	170	178	189	201	214	229	264	283	304
Net book value	250	265	287	307	335	374	417	461	515	601	666	726

* Based on straight line over 25 years up to 1956 and over 30 years from 1957.

Disposals – book value	—	—	—	—	—	—	—	—	—	—	—	—
proceeds	—	—	—	—	—	—	—	—	—	—	—	—

Fixed Assets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Cost												
Brought forward	1,030	1,145	1,264	1,378	1,495	1,639	1,795	1,972	2,196	2,481	2,779	3,208
Added in year	114	109	125	132	164	191	215	271	323	359	415	473
(Disposals)	1	10	(11)	(15)	(20)	(35)	(38)	(47)	(38)	(61)	(68)	(39)
Carried forward	1,145	1,264	1,378	1,495	1,639	1,795	1,972	2,196	2,481	2,779	3,126 +82	3,642

Depreciation												
Brought forward	304	343	394	428	462	494	521	552	584	632	668	755
Charged in year	38	41	45	49	52	57	64	74	81	92	112	130
(Disposals)	1	10	(11)	(15)	(20)	(30)	(33)	(42)	(33)	(56)	(43)	(33)
Carried forward	343	394	428	462	494	521	552	584	632	668	755	852
Net book value	802	870	950	1,033	1,145	1,274	1,420	1,612	1,849	2,111	2,453	2,790
Disposals – book value	—	—	—	—	—	5	5	5	5	5	25	6
proceeds	—	—	—	—	—	5	5	5	5	5	25	6

Post Office. Adjusted. Balance Sheets and Profit and Loss Accounts, 1948–71 ($_{68}$£ *million*)

Balance Sheets		*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Net monetary assets		32	37	40	39	34	34	37	37	41	47	52	44
Net fixed assets		451	475	509	539	574	618	666	712	766	854	915	968
		483	512	549	578	608	652	703	749	807	901	967	1,012
Capital	441	482	514	554	585	623	677	736	792	862	927	986	1,027
Cumulative losses		(2)	(4)	(7)	(11)	(20)	(30)	(37)	(47)	(59)	(54)	(46)	(30)
Reserves		3	2	2	4	5	5	4	4	4	28	27	15
		483	512	549	578	608	652	703	749	807	901	967	1,012
Profit and Loss Accounts													
Profit before depreciation		79	70	71	70	54	54	62	62	59	80	91	102
Depreciation		29	31	34	36	36	39	42	45	47	42	46	49
Monetary losses		2	1	1	2	4	2	—	1	2	1	2	1
Profit before interest		48	38	36	32	14	13	20	16	10	37	43	52
Interest charged		16	15	16	16	16	16	18	20	20	26	29	31
Profit (loss) after interest		32	23	20	16	(2)	(3)	2	(4)	(10)	11	14	21
Paid to Exchequer		34	25	23	20	7	7	9	6	2	6	6	5
Retained profit (loss)		(2)	(2)	(3)	(4)	(9)	(10)	(7)	(10)	(12)	5	8	16
PBI/Assets (%)		10·3	7·6	6·8	5·7	2·4	2·1	2·9	2·2	1·3	4·3	4·6	5·3

Balance Sheets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Net monetary assets	70	95	79	56	57	51	58	60	79	113	50	34
Net fixed assets	1,038	1,097	1,165	1,231	1,324	1,423	1,531	1,672	1,846	2,029	2,237	2,440
	1,108	1,192	1,244	1,287	1,381	1,474	1,589	1,732	1,925	2,142	2,287	2,474
Eurodollar loan												5
Capital	1,073	1,125	1,166	1,200	1,263	1,342	1,426	1,537	1,703	1,892	2,064	2,241
Retained profits	(3)	24	35	43	75	91	121	152	179	205	205	209
Reserves	38	43	43	44	43	41	42	43	43	45	18	19
	1,108	1,192	1,244	1,287	1,381	1,474	1,589	1,732	1,925	2,142	2,287	2,474
Profit and Loss Accounts												
Profit before depreciation	117	124	109	110	137	133	156	170	179	197	215	226
Depreciation	52	56	59	63	65	68	75	81	85	92	104	119
Losses on disposals	—	—	—	—	—	4	3	5	5	4	23	5
Monetary losses	—	2	4	2	1	2	2	2	2	6	4	3
Profit before interest	65	66	46	45	71	59	76	82	87	95	84	99
Interest charged	33	34	35	37	39	43	46	51	60	69	84	95
Retained profit	32	32	11	8	32	16	30	31	27	26	—	4
Paid to Exchequer	5	5										
	27	27										
PBI/Assets (%)	6·2	5·8	3·8	3·6	5·3	4·1	5·0	4·9	4·8	4·7	3·8	4·2

Post Office. Adjusted. Fixed Assets, 1948–71 ($_{68}$£ *million*)

Fixed Assets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*
Cost												
Brought forward	649	705	742	790	836	882	942	1,005	1,067	1,139	1,282	1,366
Added in year	56	55	68	66	71	83	90	91	101	130	107	102
(Disposals)	—	(18)	(20)	(20)	(25)	(23)	(27)	(29)	(29)	13	(23)	(25)
Carried forward	705	742	790	836	882	942	1,005	1,067	1,139	1,282	1,366	1,443
Depreciation												
Brought forward	225	254	267	281	297	308	324	339	355	373	428	451
Charged in year*	29	31	34	36	36	39	42	45	47	42	46	49
(Disposals)	—	(18)	(20)	(20)	(25)	(23)	(27)	(29)	(29)	13	(23)	(25)
Carried forward	254	267	281	297	308	324	339	355	373	428	451	475
Net book value	451	475	509	539	574	618	666	712	766	854	915	968

* Based on straight line over 25 years up to 1956 and over 30 years from 1957.
Disposals – book value and proceeds *nil* 1948–59.

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Fixed Assets	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
Cost												
Brought forward	1,443	1,567	1,700	1,807	1,909	2,031	2,144	2,266	2,412	2,612	2,786	3,042
Added in year	122	115	127	129	158	176	190	231	268	283	311	331
(Disposals)	2	18	(20)	(27)	(36)	(63)	(68)	(85)	(68)	(109)	(116)	(61)
Carried forward	1,567	1,700	1,807	1,909	2,031	2,144	2,266	2,412	2,612	2,786	2,981 +61	3,312
Depreciation												
Brought forward	475	529	603	642	678	707	721	735	740	766	757 18*	805
Charged in year	52	56	59	63	65	68	75	81	85	92	104	119
(Disposals)	2	18	(20)	(27)	(36)	(54)	(61)	(76)	(59)	(101)	(74)	(52)
Carried forward	529	603	642	678	707	721	735	740	766	757	805	872
Net book value	1,038	1,097	1,165	1,231	1,324	1,423	1,531	1,672	1,846	2,029	2,237	2,440
Disposals – book value	—	—	—	—	—	9	7	9	9	8	42	9
proceeds	—	—	—	—	—	5	4	4	4	4	19	4
Loss on disposal	—	—	—	—	—	4	3	5	5	4	23	5

Appendix 6

Rail (BTC). Conventional. Balance Sheets and Profit and Loss Accounts, 1948–62 (c£ *million*)

Balance Sheets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1361*	*1962*
Net money liabilities	(25)	(52)	(122)	(111)	(69)	(96)	(60)	(127)	(135)	(123)	(129)	(158)	(147)	(132)	(150)
Net fixed assets	1,237	1,269	1,341	1,371	1,391	1,424	1,455	1,493	1,486	1,561	1,671	1,799	1,931	2,038	2,100
	1,212	1,217	1,219	1,260	1,322	1,328	1,395	1,366	1,351	1,438	1,542	1,641	1,784	1,906	1,950
Capital	1,217	1,242	1,259	1,300	1,362	1,363	1,442	1,444	1,484	1,640	1,848	2,046	2,321	2,503	2,829
Accumulated losses	(5)	(25)	(40)	(40)	(32)	(28)	(40)	(71)	(126)	(195)	(300)	(400)	(533)	(593)	(876)
Reserves	—	—	—	—	(8)	(7)	(7)	(7)	(7)	(7)	(6)	(5)	(4)	(4)	(3)
	1,212	1,217	1,219	1,260	1,322	1,328	1,395	1,366	1,351	1,438	1,542	1,641	1,784	1,906	1,950
Profit and Loss Accounts															
Profit before depreciation	55	45	52	71	84	85	72	54	33	29	5	24	3	(10)	(22)
Depreciation	18	21	22	26	30	30	31	31	33	36	38	41	43	47	50
Profit before interest	37	24	30	45	54	55	41	23	—	(7)	(33)	(17)	(40)	(57)	(72)
Interest charged	42	44	45	45	46	51	53	54	55	62	72	83	93	103	111
Profit (loss) after interest	(5)	(20)	(15)	—	8	4	(12)	(31)	(55)	(69)	(105)	(100)	(133)	(160)	(183)
PBI/Assets (%)	3·0	2·0	2·5	3·6	4·2	4·2	3·0	1·7	—	(0·5)	(2·2)	(1·1)	(2·3)	(3·1)	(3·7)

Rail (BTC). Conventional. Fixed Assets, 1948–62 (c£ *million*)

Old	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*
Cost															
Brought forward	1,614	1,614	1,579	1,598	1,583	1,563	1,537	1,504	1,470	1,442	1,412	1,374	1,339	1,320	1,295
(Disposals)	—	(35)	19	(15)	(20)	(26)	(33)	(34)	(28)	(30)	(38)	(35)	(19)	(25)	(53)
Depreciation															
Brought forward	359	375	356	391	392	388	377	359	340	326	310	286	264	258	246
Charge (1%)	16	16	16	16	16	15	15	15	14	14	14	13	13	13	12
(Disposals)	—	(35)	19	(15)	(20)	(26)	(33)	(34)	(28)	(30)	(38)	(35)	(19)	(25)	(53)
New															
Cost															
Brought forw	—	—	53	147	203	253	316	378	447	473	584	732	901	1,076	1,230
Additions	—	53	94	56	50	63	62	69	26	111	148	169	175	154	112
Depreciation															
Brought forward	—	2	7	13	23	37	52	68	84	103	125	149	177	207	241
Charge (1/30) (1/35 after*)	2	5	6	10	14	15	16	16	19	22	24	28*	30	34	38
Net book value	1,237	1,269	1,341	1,371	1,391	1,424	1,455	1,493	1,486	1,561	1,671	1,799	1,931	2,038	2,100

Rail (BTC). Adjusted. Balance Sheets and Profit and Loss Accounts, 1948–62 (${}_{62}$£ *million*)

Balance Sheets	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*
Net monetary liabilities	(41)	(83)	(189)	(154)	(90)	(123)	(75)	(148)	(154)	(134)	(138)	(169)	(154)	(133)	(147)
Net fixed assets	2,145	2,198	2,309	2,349	2,369	2,404	2,435	2,471	2,451	2,522	2,627	2,750	2,877	2,972	3,015
	2,104	2,115	2,120	2,195	2,279	2,281	2,360	2,323	2,297	2,388	2,489	2,581	2,723	2,839	2,868
Capital	2,109	2,150	2,177	2,236	2,318	2,319	2,419	2,421	2,467	2,641	2,865	3,077	3,369	3,658	3,880
Accumulated losses	(7)	(37)	(59)	(44)	(33)	(34)	(54)	(94)	(165)	(248)	(374)	(495)	(647)	(820)	(1,014)
Reserves	2	2	2	3	(6)	(4)	(5)	(4)	(5)	(5)	(2)	(1)	1	1	2
	2,104	2,115	2,120	2,195	2,279	2,281	2,360	2,323	2,297	2,388	2,489	2,581	2,723	2,839	2,868
Profit and Loss Accounts															
Profit before depreciation	92	73	82	103	111	109	91	65	38	32	5	26	3	(10)	(22)
Depreciation	30	33	37	41	46	46	47	47	50	53	55	58	59	63	67
Monetary gain	1	2	4	18	7	2	3	7	4	7	2	—	3	6	4
Profit before interest	63	42	49	80	72	65	47	25	(8)	(14)	(48)	(32)	(53)	(67)	(85)
Interest charged	70	72	71	65	61	66	67	65	63	69	78	89	99	106	109
Profit (loss) after interest	(7)	(30)	(22)	15	11	(1)	(20)	(40)	(71)	(83)	(126)	(121)	(152)	(173)	(194)
PBI/Assets (%)	2·9	2·0	2·3	3·7	3·2	2·9	2·0	1·1	(0·3)	(0·6)	(2·0)	(1·3)	(2·0)	(2·4)	(3·0)

Rail (BTC). Adjusted. Fixed Assets, 1948–62 ($_{62}$£ *million*)

Old	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*
Cost															
Brought forward	2,797	2,797	2,736	2,769	2,743	2,708	2,663	2,606	2,547	2,498	2,446	2,380	2,319	2,286	2,243
(Disposals)	—	(61)	33	(26)	(35)	(45)	(57)	(59)	(49)	(52)	(66)	(61)	(33)	(43)	(92)
Depreciation															
Brought forward	622	650	616	677	678	670	652	621	587	563	535	493	455	445	424
Charge (1%)	28	27	28	27	27	27	26	25	25	24	24	23	23	22	22
(Disposals)	—	(61)	33	(26)	(35)	(45)	(57)	(59)	(49)	(52)	(66)	(61)	(33)	(43)	(92)
New															
Cost															
Brought forward	—	—	86	234	315	381	462	540	623	653	777	937	1,118	1,304	1,462
Additions	—	86	148	81	66	81	78	83	30	124	160	181	186	158	110
Depreciation															
Brought forward	—	2	8	17	31	50	69	90	112	137	166	197	232	268	309
Charge (1/30) (1/35 after *)	2	6	9	14	19	19	21	22	25	29	31	35*	36	41	45
Net book value	2,145	2,198	2,309	2,349	2,369	2,404	2,435	2,471	2,451	2,522	2,627	2,750	2,877	2,972	3,015

Rail. Conventional. Balance Sheets and Profit and Loss Accounts, 1963–70 (c£ *million*)

Balance Sheets	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*Trans-ferred*	*W/off*	*1/1/69*	*1969*	*1970*
Net money liabilities	(199)	(225)	(246)	(249)	(252)	(244)	(235)	5	(173)	(403)	(397)	(415)
Net fixed assets	1,449	1,473	1,503	1,546	1,549	1,532	1,513	(35)	(710)	768	777	827
	1,250	1,248	1,257	1,297	1,297	1,288	1,278	(30)	(883)	365	380	412
Capital – suspended	705	705	705	705	705	705	705		(705)			
interest	857	857	872	907	912	922	922	(30)	(527)	365	365	365
Accumulated profit (loss)	—	(2)	(3)	(5)	(4)	(6)	(4)		4	—	15	25
Capital deficit	(312)	(312)	(317)	(310)	(316)	(333)	(345)		345			22
	1,250	1,248	1,257	1,297	1,297	1,288	1,278	(30)	(883)	365	380	412
Profit and Loss Accounts												
Loss before depreciation		17	2	8	6	20	13				profit 81	77
Depreciation		59	61	63	65	66	67				44	46
Loss before interest		76	63	71	71	86	80				profit 37	31
Interest charged		58	58	61	64	67	67				22	21
Loss after interest		134	121	132	135	153	147				profit 15	10
Grants received		132	120	130	136	151	149				incl. above 76	74
Profit (loss) after grants		(2)	(1)	(2)	1	(2)	2				before grants (61)	(64)
PBI/Assets (%)		(6·1)	(5·0)	(5·6)	(5·5)	(6·7)	(6·2)				9·9	7·8

Rail. Conventional. Fixed Assets, 1963–70 (c£ *million*)

	1962	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*Trans-ferred*	*W/off*	*1/1/69*	*1969*	*1970*
Land and non-op. buildings	250	247	243	247	226	208	192	1	53	138	125	137
Ways and Structures	431											
Cost												
Brought forward		544	583	631	682	730	773	21	445	344	344	388
Additions		43	52	56	54	49	45				45	55
(Disposals)		(4)	(4)	(5)	(6)	(6)	(8)				(1)	(1)
Depreciation												
Brought forward		113	123	133	144	156	170	4	132	47	47	58
Charge (1/40)		14	15	16	17	18	19				(1/35) 11	13
(Disposals)		(4)	(5)	(5)	(5)	(4)	(6)					(1)
Rolling Stock and Plant	768											
Cost												
Brought forward		1,137	1,134	1,134	1,144	1,142	1,112	31	49	1,024	1,024	1,021
Additions		53	56	64	52	47	42				23	30
(Disposals)		(56)	(56)	(54)	(54)	(77)	(50)				(26)	(29)
Depreciation												
Brought forward		369	368	372	383	393	391	14	(295)	691	691	699
Charge (1/25)		45	46	47	48	48	48				(1/30) 34	34
(Disposals)		(46)	(42)	(36)	(38)	(50)	(29)				(26)	(29)
Net book value	1,449	1,473	1,503	1,546	1,549	1,532	1,513	35	710	768	777	827
Book value of disposals	—	10	13	18	17	29	23				1	—

Rail. Adjusted. Balance Sheets and Profit and Loss Accounts, 1963–70 ($_{62}$£ *million*)

Balance Sheets	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*Trans-ferred*	*W/off*	*1/1/69*	*1969*	*1970*
Net money liabilities	(195)	(216)	(225)	(218)	(213)	(201)	(183)	4	(135)	(314)	(296)	(296)
Net fixed assets	2,015	2,006	1,999	2,002	1,954	1,883	1,814	(42)	(1,174)	598	602	635
	1,820	1,790	1,774	1,784	1,741	1,682	1,631	(38)	(1,309)	284	306	349
Capital	2,276	2,276	2,290	2,321	2,325	2,333	2,333	(38)	(2,011)	284	284	284
Accumulated profit (loss)	—	(31)	(55)	(86)	(115)	(165)	(197)	—	197	—	22	47
Reserves	—	1	—	2	(9)	(5)	(9)	—	9	—	—	18
Capital deficit	(456)	(456)	(461)	(453)	(460)	(481)	(496)	—	496	—	—	—
	1,820	1,790	1,774	1,784	1,741	1,682	1,631	(38)	(1,309)	284	306	349

Profit and Loss Accounts								
Loss before depreciation	18	2	9	5	24	10	profit 61	55
Depreciation	83	83	84	84	84	84	36	36
Loss on sale of fixed assets	5	7	10	10	17	14	—	—
Monetary gain	4	10	10	8	5	11	(14)	(21)
Loss before interest	102	82	93	91	120	97	profit 39	40
Interest charged	56	54	54	55	56	54	17	15
Loss after interest	158	136	147	146	176	151	profit 22	25
Grants received	127	112	116	117	126	119	incl. above 58	53
'Retained loss'	31	24	31	29	50	32	before grants (36)	(28)
PBI/Assets (%)	(5·7)	(4·6)	(5·2)	(5·2)	(7·0)	(5·9)	13·2	12·2

Rail. Adjusted. Fixed Assets, 1963–69 ($_{62}$£ *million*)

	1962	*1963*	*1964*	*1965*	*1966*	*1967*	*1968*	*Trans-ferred*	*W/off*	*1/1/69*	*1969*	*1970*
Land and non-op buildings	355	351	345	351	321	295	272	3	162	107	97	106
Ways and structures	602											
Cost												
Brought forward		773	809	852	895	932	964	33	688	268	268	301
Additions		42	49	50	46	41	36				34	39
(Disposals)		(6)	(6)	(7)	(9)	(9)	(11)				(1)	(1)
Depreciation												
Brought forward		171	184	197	211	226	243	6	215	37	37	46
Charge (1/40)		19	20	21	22	23	24				(1/35) 9	10
(Disposals)		(6)	(7)	(7)	(7)	(6)	(9)				—	(1)
Rolling Stock and Plant	1,058											
Cost												
Brought forward		1,615	1,586	1,558	1,538	1,506	1,436	233	368	798	798	795
Additions		51	52	57	45	39	34				17	21
(Disposals)		(80)	(80)	(77)	(77)	(109)	(71)				(20)	(23)
Depreciation												
Brought forward		557	556	559	571	579	569	221	(171)	538	538	545
Charge (1/25)		64	63	63	62	61	60				(1/30)27	26
(Disposals)		(65)	(60)	(51)	(54)	(71)	(41)				(20)	(23)
Net book value	2,015	2,006	1,999	2,002	1,954	1,883	1,814	42	1,174	598	602	635
Book value of disposals		15	19	26	25	41	32				1	—
Assumed proceeds		10	12	16	15	24	18				1	—
Loss on sale of fixed assets		5	7	10	10	17	14				—	—

Rail (BTC). Split of British Transport Commission at 31/12/62. Conventional and Adjusted

	BTC 31/12/62 accounts	*Adjust-ments=*	*BTC 31/12/62= adjusted*	*British Rail*	*London Transport*	*British Waterways*	*British Transport Docks*	*Transport Holding Company*
Conventional (c£ *millions*)								
Net monetary liabilities	(150)	— =	(150)=	(199)	(4)	—	—	53
Fixed Assets								
Cost	2,584	(172) =	2,412 =	1,931	227	12	84	158
Depreciation	(484)	(124) =	(608)=	(482)	(58)	—	—	(68)
Net	2,100	(296) =	1,804 =	1,449	169	12	84	90
Total net assets	1,950	(296) =	1,654 =	1,250	165	12	84	143
Capital	2,829	— =	1,950 =	1,562	162	20	84	122
Accumulated losses	(879)							
Capital reserves					3			21
Capital deficit	—	(296) =	(296)=	(312)		(8)	—	
Adjusted ($_{62}$£ *millions*)								
Net monetary liabilities	(147)	— =	(147)=	(195)	(4)	—	—	52
Fixed Assets								
Cost	3,723	(297) =	3,426 =	2,743	322	17	120	224
Depreciation	(708)	(211) =	(919)=	(728)	(88)	—	—	(103)
Net	3,015	(508) =	2,507 =	2,015	234	17	120	121
Total net assets	2,868	(508) =	2,360 =	1,820	230	17	120	173
Capital	3,880	(68) =	2,800 =	2,276	227	25	120	152
Accumulated losses	(1,012)							
Capital reserves	—	68 =	(440)=	68	3			21
(Capital deficit	—	(508)		(524)		(8)	—	
	2,868	(508) =	2,360 =	1,820	230	17	120	173

Rail. Capital re-organisation and adjustments at 1/1/69. Conventional and Adjusted

	Conventional (Current £ million)				*Adjusted (1962 £ million)*			
	31/12/68	*Trans-ferred*	*Written off*	*1/1/69*	*31/12/68*	*Trans-ferred*	*Written off*	*1/1/69*
Deposits	(198)	—	—	(198)	(159)	—	—	(159)
Pensions	(110)	8	(113)	(215)	(86)	6	(87)	(167)
Obsolescence	—	—	(56)	(56)	—	—	(44)	(44)
Monetary liabilities	(308)	8	(169)	(469)	(245)	6	(131)	(370)
Net assets	73	(3)	(4)	66	62	(2)	(4)	56
Net monetary liabilities	(235)	5	(173)	(403)	(183)	4	(135)	(314)
Fixed assets								
Cost	2,106	(53)	(547)	1,506	2,660	(66)	(1,421)	1,173
Less: Depreciation	(593)	18	(163)	(738)	(846)	24	247	(575)
Net book value	1,513	(35)	(710)	768	1,814	(42)	(1,174)	598
Total net assets	1,278	(30)	(883)	365	1,631	(38)	(1,309)	284
Capital	1,627	(30)	(1,232)	365	2,333	(38)	(2,011)	284
Accumulated losses	(4)	—	4	—	(197)	—	197	—
Reserves	—	—	—	—	(9)	—	9	—
Capital deficit	(345)	—	345	—	(496)	—	496	—
	1,278	(30)	(883)	365	1,631	(38)	(1,309)	284

Appendix 7

Net Monetary Assets (*£ million*)

Current

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	54	95		22	(25)	10	156
1949	52	14	21	25	(52)	5	65
1950	49	63	1	25	(122)	6	22
1951	38	(40)	45	24	(111)	(7)	(51)
1952	33	(2)	22	26	(69)	3	13
1953	25	16	64	29	(96)	10	48
1954	10	(6)	28	30	(60)	4	6
1955	20	47	87	35	(127)	(6)	56
1956	(3)	65	90	41	(135)	(13)	45
1957	23	31	96	47	(123)	8	82
1958	90	12	100	41	(129)	(4)	110
1959	115	8	107	65	(158)	(2)	135
1960	117	(12)	117	90	(147)	2	167
1961	58	(5)	120	78	(132)	(4)	115
1962	62	(21)	119	57	(150)	(7)	60
1963	26	(42)	141	59	(225)	(19)	(60)
1964	48	(69)	153	55	(246)	(17)	(76)
1965	21	(99)	146	66	(249)	(33)	(148)
1966	34	(132)	140	70	(252)	(20)	(160)
1967	92	(16)	141	95	(244)	242	310
1968	103	43	162	143	(235)	259	475
1969	28	90	176	68	(397)	267	232
1970	18	143	151	50	(415)	267	214

January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	90	157		37	(41)	17	260
1949	83	22	34	40	(83)	7	103
1950	77	95	1	39	(189)	8	31
1951	52	(54)	61	34	(154)	(10)	(71)
1952	42	(3)	29	34	(90)	4	16
1953	33	20	82	37	(123)	13	62
1954	12	(7)	34	37	(75)	5	6
1955	24	55	102	41	(148)	(7)	67
1956	(3)	73	102	47	(154)	(15)	50
1957	25	34	106	52	(134)	9	92
1958	97	13	108	44	(138)	(4)	120
1959	124	9	115	70	(169)	(2)	147
1960	122	(12)	122	95	(154)	1	174
1961	59	(5)	119	79	(133)	(5)	114
1962	61	(20)	117	56	(147)	(8)	59
1963	25	(40)	135	57	(216)	(20)	(59)
1964	43	(63)	140	51	(225)	(16)	(70)
1965	18	(86)	128	58	(218)	(29)	(129)
1966	29	(111)	113	60	(213)	(17)	(139)
1967	75	(13)	115	79	(201)	203	258
1968	79	33	124	113	(183)	204	370
1969	21	66	128	50	(296)	194	163
1970	12	96	101	34	(286)	180	137

Appendix 8

Net Fixed Assets (*£ million*)

Current

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	271	468		265	1,237	53	2,294
1949	281	548	211	287	1,269	79	2,675
1950	288	637	234	307	1,341	107	2,914
1951	295	735	266	335	1,371	125	3,127
1952	321	840	296	374	1,391	146	3,368
1953	415	954	327	417	1,424	169	3,706
1954	510	1,095	362	461	1,455	196	4,079
1955	566	1,179	400	515	1,493	268	4,421
1956	618	1,314	426	601	1,486	325	4,770
1957	672	1,474	455	666	1,561	382	5,210
1958	723	1,642	473	726	1,671	439	5,674
1959	777	1,850	490	802	1,799	488	6,206
1960	800	2,030	500	870	1,931	539	6,670
1961	827	2,229	511	950	2,038	554	7,109
1962	832	2,467	536	1,033	2 100	603	7 571
1963	846	2,788	590	1,145	1,473	1,016	7,858
1964	861	3,184	635	1,274	1,503	1,109	8,566
1965	775	3,588	711	1,420	1,546	1,188	9,228
1966	749	4,038	872	1,612	1,549	1,258	10,078
1967	642	4,401	1,101	1,849	1,532	2,134	11,659
1968	636	4,607	1,250	2,111	1,513	2,291	12,408
1969	625	4,721	1,347	2,453	777	2,401	12,324
1970	633	4,801	1,449	2,790	827	2,634	13,134

January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	494	792		475	2,145	59	3,965
1949	506	919	347	509	2,198	132	4,611
1950	511	1,052	384	539	2,309	177	4,972
1951	514	1,178	426	574	2,349	201	5,242
1952	538	1,300	462	618	2,369	228	5,515
1953	647	1,429	497	666	2,404	256	5,899
1954	776	1,586	536	712	2,435	286	6,331
1955	828	1,664	574	766	2,471	369	6,672
1956	874	1,794	598	854	2,451	430	7,001
1957	919	1,944	622	915	2,522	489	7,411
1958	958	2,096	632	968	2,627	544	7,825
1959	999	2,285	641	1,038	2,750	590	8,303
1960	1,008	2,439	643	1,097	2,877	638	8,702
1961	1,018	2,601	642	1,165	2,972	642	9,040
1962	1,004	2,792	652	1,231	3,015	681	9,375
1963	994	3,056	690	1,324	2,006	1,218	9,288
1964	988	3,371	715	1,423	1,999	1,288	9,784
1965	818	3,671	764	1,531	2,002	1,342	10,128
1966	760	3,990	886	1,672	1,954	1,389	10,651
1967	610	4,222	1,059	1,846	1,883	2,108	11,728
1968	590	4,306	1,153	2,029	1,814	2,175	12,067
1969	565	4.298	1.189	2.237	602	2.215	11.106

Appendix 9

Other Assets (*£ million*)
Current

	Coal	*Elec*	*Gas*	*etc.*	*Total*
1948		64			64
1949		58			58
1950		58			58
1951		43			43
1952		44			44
1953		38			38
1954		35			35
1955		34			34
1956		31			31
1957		29			29
1958		26			26
1959		30			30
1960		32			32
1961		37			37
1962		44			44
1963		60		60	120
1964		67		61	128
1965	4	70		67	141
1966	6	68		71	145
1967	8	63	15	151	237
1968	11	63	55	138	267
1969	13	70	110	101	294
1970	16	82	200	99	397

January 1962

	Coal	*Elec*	*Gas*	*etc.*	*Total*
1948		109			109
1949		99			99
1950		99			99
1951		73			73
1952		75			75
1953		65			65
1954		60			60
1955		58			58
1956		53			53
1957		49			49
1958		44			44
1959		47			47
1960		47			47
1961		50			50
1962		55			55
1963		68		59	127
1964		73		60	133
1965	3	74		65	142
1966	5	70	6	68	149
1967	7	65	14	135	221
1968	9	60	45	125	239
1969	11	65	87	84	247
1970	13	73	149	83	318

Appendix 10

Foreign Debt (*£ million*)
Current

	Elec	*Gas*	*PO*	*etc.*	*Total*
1966				1	1
1967				7	7
1968				28	28
1969	21	32		45	98
1970	36	68	8	82	194

January 1962

	Elec	*Gas*	*PO*	*etc.*	*Total*
1966				1	1
1957				6	6
1968				21	21
1969	15	23		33	71
1970	24	46	5	55	130

Appendix 11

Government Capital (*£ million*)
Current

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	344	623		287	1,217	64	2,535
1949	342	608	228	312	1,242	86	2,818
1950	337	740	229	332	1,259	112	3,009
1951	340	717	304	359	1,300	116	3,136
1952	365	854	304	400	1,362	149	3,434
1953	450	967	374	446	1,363	183	3 783
1954	533	1,064	369	491	1,442	203	4,102
1955	618	1,189	465	550	1,444	268	4,534
1956	633	1,327	490	607	1,484	315	4,856
1957	717	1,435	520	661	1,640	395	5,368
1958	838	1,554	543	699	1,848	454	5,936
1959	941	1,735	569	742	2,046	503	6,536
1960	974	1,881	588	791	2,321	556	7,111
1961	958	2,065	601	831	2,603	614	7,672
1962	963	2,252	622	866	2,829	661	8,193
1963	927	2,497	691	931	1,562	1,104	7,712
1964	960	2,810	741	1 016	1,577	1,179	8,283
1965	575	3,102	802	1,111	1,612	1,125	8,327
1966	613	3,496	961	1,241	1,617	1,193	9,121
1967	695	3,830	1,228	1,441	1,627	2,343	11,164
1968	718	3,994	1,435	1,681	1,627	2,447	11,902
1969	668	4,077	1,592	1,910	365	2,521	11,133
1970	675	4,263	1,726	2,163	365	2,672	11,864

January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	633	1,030		514	2,109	78	4,364
1949	630	1,006	378	554	2,150	146	4,864
1950	622	1,212	378	585	2,177	187	5,161
1951	626	1,180	484	623	2,236	192	5,341
1952	659	1,346	484	677	2,318	234	5,718
1953	769	1,491	573	736	2,319	276	6,164
1954	874	1,612	568	792	2,419	297	6,562
1955	977	1,760	682	862	2,421	383	7,085
1956	994	1,918	710	927	2,467	436	7,452
1957	1,088	2,037	744	986	2,641	525	8,021
1958	1,219	2,165	768	1,027	2,865	590	8,634
1959	1,329	2,359	796	1,073	3,077	642	9,276
1960	1,364	2,513	816	1,125	3,369	698	9,885
1961	1,347	2,699	829	1,166	3,658	758	10,457
1962	1,352	2,882	850	1,200	3,880	804	10,968
1963	1,318	3,118	916	1,263	2,276	1,378	10,269
1964	1,348	3,407	962	1,342	2,290	1,447	10,796
1965	550	3,665	1,016	1,426	2,321	1,341	10,319
1966	582	4,000	1,151	1,537	2,328	1,393	10,988
1967	650	4,278	1,375	1,703	2,333	2,346	12,685
1968	668	4,407	1,537	1,892	2,333	2,448	13,285
1969	631	4,470	1,655	2,064	284	2,428	11,532
1970	636	4,601	1,748	2,241	284	2,525	12,035

Appendix 12

Reserves (*£ million*)

Current

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	(19)	4			(5)	(1)	(21)
1949	(9)	12	4		(25)	(2)	(20)
1950	(—)	18	6		(40)	1	(15)
1951	(7)	21	7		(40)	2	(17)
1952	(11)	28	14		(40)	—	(9)
1953	(10)	41	17		(35)	(4)	9
1954	(13)	60	21		(47)	(3)	18
1955	(32)	71	22		(78)	(6)	(23)
1956	(18)	83	26	35	(133)	(3)	(10)
1957	(22)	99	31	52	(202)	(5)	(47)
1958	(25)	126	30	68	(306)	(19)	(126)
1959	(49)	153	28	125	(405)	(17)	(165)
1960	(57)	169	29	169	(537)	(15)	(242)
1961	(73)	196	30	197	(697)	(64)	(411)
1962	(69)	238	33	224	(879)	(65)	(518)
1963	(55)	309	40	273	(314)	(47)	206
1964	(51)	372	47	313	(320)	(26)	335
1965	225	457	55	375	(315)	97	894
1966	176	478	51	441	(320)	115	941
1967	47	618	29	503	(339)	177	1,035
1968	32	719	32	573	(349)	213	1,220
1969	(2)	783	9	611	15	203	1,619
1970	(8)	727	6	669	47	246	1,687

January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	(49)	28		(2)	(5)	(2)	(30)
1949	(41)	34	3	(5)	(35)	(7)	(51)
1950	(34)	34	7	(7)	(57)	(2)	(59)
1951	(60)	17	3	(15)	(41)	(1)	(97)
1952	(79)	26	7	(25)	(39)	(2)	(112)
1953	(89)	23	6	(33)	(38)	(7)	(138)
1954	(86)	27	2	(43)	(59)	(6)	(165)
1955	(125)	17	(6)	(55)	(98)	(21)	(288)
1956	(123)	2	(10)	(26)	(170)	(21)	(348)
1957	(144)	(10)	(16)	(19)	(253)	(27)	(469)
1958	(164)	(12)	(28)	(15)	(376)	(50)	(645)
1959	(206)	(18)	(40)	35	(496)	(54)	(779)
1960	(234)	(39)	(51)	67	(646)	(59)	(962)
1961	(270)	(53)	(68)	78	(819)	(121)	(1,253)
1962	(287)	(55)	(81)	87	(1,012)	(131)	(1,479)
1963	(299)	(34)	(91)	118	(486)	(121)	(913)
1964	(317)	(26)	(107)	132	(516)	(115)	(949)
1965	289	(6)	(124)	163	(537)	37	(178)
1966	212	(51)	(146)	195	(584)	46	(328)
1967	42	(4)	(187)	222	(651)	94	(484)
1968	10	(8)	(215)	250	(702)	35	(630)
1969	(34)	(56)	(274)	223	22	32	(87)
1970	(59)	(212)	(312)	228	65	(23)	(313)

Appendix 13

Depreciation Charge (*£ million*)

Current

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	17	31		18	18	3	87
1949	20	34	9	20	21	5	109
1950	21	36	12	22	22	6	119
1951	24	39	12	22	26	6	129
1952	27	43	14	24	30	8	146
1953	33	49	16	27	30	9	164
1954	35	54	19	29	31	8	176
1955	40	56	21	31	31	10	189
1956	43	63	24	45	33	13	221
1957	47	69	25	49	36	14	240
1958	51	80	26	52	38	16	263
1959	56	93	28	52	41	20	290
1960	60	104	29	56	43	26	318
1961	64	112	33	60	47	33	349
1962	76	127	32	63	50	29	377
1963	88*	138	35	70	59	44	434
1964	72	156	41	78	61	56	464
1965	64	177	40	85	63	57	486
1966	65	198	44	95	65	59	526
1967	54	223	58	104	66	62	567
1968	54	251	69	118	67	176	735
1969	60	261	99	139	44	245	848
1970	62	276	85	167	46	208	844
	1,133	2,670	771	1,426	968	1,113	8,081

January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Tota*
1948	32	52		31	30	5	150
1949	37	57	15	34	33	8	184
1950	39	62	18	36	37	9	201
1951	42	67	20	36	41	10	216
1952	47	72	22	39	46	11	237
1953	54	80	25	42	46	13	260
1954	58	86	28	45	47	13	277
1955	62	88	31	47	47	16	291
1956	64	96	34	42	50	18	304
1957	67	102	35	46	53	20	323
1958	71	114	37	49	55	23	349
1959	76	134	39	52	58	29	388
1960	80	146	41	56	59	33	415
1961	83	153	46	59	63	39	443
1962	94	166	45	63	67	38	473
1963	109*	178	48	65	88	54	542
1964	86	195	55	72	90	67	565
1965	70	213	54	78	94	63	572
1966	68	233	53	86	94	64	598
1967	55	255	69	90	101	69	639
1968	54	277	81	96	98	193	799
1969	61	289	119	127	36	225	857
1970	62	303	90	124	36	189	804
	1,471	3,418	1,005	1,415	1,369	1,209	9,887

*15 months period ending 31. 3. 64.

Appendix 14

Monetary (Gains) and Losses (*£ million*)
January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	4	2		1	(1)	—	6
1949	3	3	1	1	(2)	—	6
1950	2	3	1	2	(4)	—	4
1951	7	2	3	4	(18)	—	(2)
1952	3	(1)	2	2	(7)	—	(1)
1953	—	—	—	—	(2)	—	(2)
1954	1	1	2	1	(3)	—	2
1955	1	2	4	2	(7)	—	2
1956	—	2	3	1	(4)	—	2
1957	1	2	4	2	(7)	—	2
1958	1	—	2	1	(2)	—	2
1959	—	—	—	—	—	—	—
1960	2	—	3	2	(3)	—	4
1961	4	—	5	4	(6)	—	7
1962	1	—	3	2	(4)	—	2
1963	1	—	2	1	(4)	—	—
1964	1	(2)	6	2	(10)	—	(3)
1965	1	(3)	5	2	(10)	—	(5)
1966	1	(3)	4	2	(8)	—	(4)
1967	2	(2)	4	2	(5)	1	2
1968	4	1	7	6	(11)	12	19
1969	2	2	6	4	(14)	17	17
1970	1	7	9	3	(21)	17	16
	43	16	76	47	(153)	47	76

Appendix 15

Profit (Loss) Before Interest (*£ million*)
January 1962

Profit Before Interest (*£ million*)
Current loss

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	17	20		24	37	(6)	92
1949	23	25	8	24	24	(7)	97
1950	23	27	10	23	30	—	113
1951	13	26	11	16	45	2	113
1952	6	35	14	17	54	1	127
1953	17	46	16	21	55	—	155
1954	14	55	17	21	41	5	153
1955	1	52	19	19	23	5	119
1956	34	59	23	25	—	12	153
1957	20	70	26	34	(7)	10	153
1958	28	87	20	43	(33)	(1)	144
1959	13	95	21	57	(17)	20	189
1960	20	94	26	61	(40)	21	182
1961	27	120	26	48	(57)	(26)	138
1962	45	146	31	50	(72)†	20	220†
1963	73*	184	35	72	(76)	46	334
1964	43	193	41	66	(63)	80	360
1965	—*	236	43	92	(71)	68†	368
1966	28	197	42	105	(71)	74	375
1967	34	258	31	111	(86)	71	419
1968	29	323	76	132	(80)	79	559
1969	9	306	70	148	37†	118	688†
1970	35	205	103	156	31	76	606
	552	2,859	709	1,365	(296)	668	5,857

Special losses:
1962 Rail 296; 1965 Coal 299; 1965 BOAC 48; 1969 Rail 883

Net	253	2,859	709	1,365	(1,475)	620	4,331

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	21	31		38	63	(11)	142
1949	29	35	11	36	42	(11)	142
1950	29	33	15	32	49	(1)	157
1951	3	23	10	14	80	(2)	128
1952	(6)	31	13	13	72	1	124
1953	9	42	16	20	65	(1)	151
1954	4	49	15	16	47	4	135
1955	(13)	38	13	10	25	1	74
1956	25	41	17	37	(8)	9	121
1957	7	49	17	43	(14)	7	109
1958	14	65	11	52	(48)	(7)	87
1959	(2)	68	13	65	(32)	15	127
1960	3	63	15	66	(53)	18	112
1961	7	82	9	46	(67)	(31)	46
1962	24	101	13	45	(85)†	10	108†
1963	44*	132	17	71	(102)	33	195
1964	23	129	15	59	(82)	59	203†
1965	(14)*	155	14	76	(93)	46†	184†
1966	10	106	16	82	(91)	48	171
1967	16	147	2	87	(120)	40	172
1968	5	174	26	95	(97)	1	204
1969	(11)	134	1	84	39†	36	283†
1970	5	26	33	99	40	(11)	192
	232	1,754	312	1,186	(370)	253	3,367

Special losses:
1962 Rail 508; 1965 Coal 412; 1965 BOAC 71; 1969 Rail 1,309

Net	(180)	1,754	312	1,186	(2,187)	182	1,067

*15 months period to 31. 3. 64.
†Before special write-off

Appendix 16

January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	16	16		9	42	1	84
1949	13	18	8	10	44	3	96
1950	15	21	8	10	45	3	102
1951	15	23	10	11	45	3	107
1952	14	28	12	12	46	4	116
1953	16	33	13	14	51	6	133
1954	18	36	14	16	53	6	143
1955	20	40	17	17	54	7	155
1956	21	47	19	23	55	9	174
1957	26	54	21	26	62	11	200
1958	32	60	21	29	72	14	228
1959	37	68	23	31	83	17	259
1960	41	78	25	32	93	20	289
1961	42	93	25	35	103	23	321
1962	44	103	26	38	111	28	350
1963	53*	114	28	41	58	41	335
1964	43	129	31	46	58	52	359
1965	25	151	35	52	61	46	370
1966	28	176	43	60	64	49	420
1967	34	203	57	72	67	53	486
1968	37	222	73	88	67	86	573
1969	35	242	88	112	22	110	609
1970	35	261	107	136	21	99	659
	660	2 216	704	920	1,377	691	6,568

Interest Charged (*£ million*)
Current

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Tota*
1948	26	27		15	70	1	139
1949	21	29	12	16	72	5	155
1950	23	33	13	16	71	5	161
1951	21	32	14	16	65	3	151
1952	19	37	16	16	61	6	155
1953	21	42	17	18	66	7	171
1954	22	45	19	20	67	7	180
1955	25	47	20	20	65	8	185
1956	25	54	21	26	63	10	199
1957	29	59	23	29	69	13	222
1958	35	64	23	31	78	15	246
1959	40	73	25	33	89	19	279
1960	44	82	26	34	99	22	307
1961	43	94	26	35	106	23	327
1962	43	101	26	37	109	27	343
1963	51*	110	27	39	56	41	324
1964	40	119	29	43	54	49	334
1965	22	133	31	46	54	41	327
1966	24	150	36	51	55	42	358
1967	28	169	47	60	56	45	405
1968	29	175	57	69	54	68	452
1969	26	181	65	84	17	84	457
1970	24	182	72	95	15	64	452
	681	2,038	645	849	1,511	605	6,329

*15 months period to 31.3.64

Appendix 17

Profit (Loss) After Interest (*£ million*)
Current

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	1	4		15	(5)	(7)	8
1949	10	7	—	14	(20)	(10)	1
1950	8	6	2	13	(15)	(3)	11
1951	(2)	3	1	5	—	(1)	6
1952	(8)	7	2	5	8	(3)	11
1953	1	13	3	7	4	(6)	22
1954	(4)	19	3	5	(12)	(1)	10
1955	(19)	12	2	2	(31)	(2)	(36)
1956	13	12	4	2	(55)	3	(21)
1957	(6)	16	5	8	(69)	(1)	(47)
1958	(4)	27	(1)	14	(105)	(15)	(84)
1959	(24)	27	(2)	26	(100)	3	(70)
1960	(21)	16	1	29	(133)	1	(107)
1961	(15)	27	1	13	(160)	(49)	(183)
1962	1	43	5	12	(183)†	(8)	(130)†
1963	20*	70	7	31	(134)	5	(1)
1964	—	64	10	20	(121)	28	1
1965	(25)*	85	8	40	(132)	22	(2)†
1966	—	21	(1)	45	(135)	25	(45)
1967	—	55	(26)	39	(153)	18	(67)
1968	(8)	101	3	44	(147)	(7)	(14)
1969	(26)	64	(18)	36	15	8	79†
1970	—	(56)	(4)	20	10	(23)	(53)
	(108)	643	5	445	(1,673)	(23)	(711)
Special	(299)				(1,179)	(48)	(1,526)
	(407)	643	5	445	(2,852)	(71)	(2,237)

(Profit) Loss After Interest (*£ million*)
January 1962

	Coal	*Elec*	*Gas*	*PO*	*Rail*	*etc.*	*Total*
1948	5	(4)		(23)	7	12	(3)
1949	(8)	(6)	1	(20)	30	16	13
1950	(6)	—	(2)	(16)	22	6	4
1951	18	9	4	2	(15)	5	23
1952	25	6	3	3	(11)	5	31
1953	12	—	1*	(2)	1	8	20
1954	18	(4)	4	4	20	3	45
1955	38	9	7	10	40	7	111
1956	—	13	4	(11)	71	1	78
1957	22	10	6	(14)	83	6	113
1958	21	(1)	12	(21)	126	22	159
1959	42	5	12	(32)	121	4	152
1960	41	19	11	(32)	152	4	195
1961	36	12	17	(11)	173	54	281
1962	19	—	13	(8)	194†	17	235†
1963	7*	(22)	10	(32)	158	8	129
1964	17	(10)	14	(16)	136	(10)	131
1965	36*	(22)	17	(30)	147	(5)†	143†
1966	14	44	20†	(31)	146	(6)	187
1967	12	22	45†	(27)	176	5	233
1968	24	1	31†	(26)	151	67	248
1969	37	47	64†	—	(22)†	48	174†
1970	19	156	39†	(4)	(25)	75	260
	449	284	333	(337)	1,881	352	2,962
Special	412				1,817	71	2,300
	861	284	333	(337)	3,698	423	5,262

*15 months period to 31.3.64
†After special write-off

Price Changes

George J. Murphy

The increasing concern for general price level adjustments in financial statements[1] requires that the accountant understand not only the technical problems of financial statement adjustment but also the several interrelated concepts of specific price changes, price level indexes, the quantity of money, the value of money, and money as a unit of measurement. Indeed, any accountant's demonstration of the technical ability to adjust financial statements without a knowledge of the relationship between the adjustments and the aforementioned concepts represents merely rote-learning. The topic of price adjustments, therefore, represents an unequalled opportunity for the accountant to integrate these various concepts in accounting and economics and to elaborate relationships that are fundamental not only to his professional work but to all human endeavour. The data in Table 1 serve to illustrate the interrelationship of these concepts.

Indexes, price levels and the value of money

Let us assume that A, B and C of Table 1 are a sample package of goods that are representative of goods generally bought and sold over the time periods t_0 to t_5. The relationship of the summation of the prices of these goods as between one year and another is therefore a commentary upon the extent to which the level of all prices (i.e. the general price level) has changed. The general price level (GPL) is calculated simply by relating the price summation of any particular year to a base year. In our example the base year is t_0 and the price levels are calculated for each year in relation to this base period.

Several aspects of this data are important. Firstly the GPL is seen to be a simple summation of the prices that attach to a representative package of goods. The prices of the goods in the package may all change proportionately – in which case the GPL changes in the same fashion (t_0 to t_1, and t_2 to t_3). Or the individual prices may either increase, decrease or remain constant, giving rise to either a constant GPL (t_1 to t_2), an increasing GPL (t_3 to t_4), or a decreasing GPL (t_4 to t_5). The calculation of the general price indexes in Table 1 is based on an Unweighted Relative of Aggregates Index. It is appropriate to indicate that the calculation of price indexes has a host of attendant problems and that there are a variety of methods that

TABLE 1

Time Period	t_0	t_1	t_2	t_3	t_4	t_5
Good						
A	\$3	\$6	\$6	\$3	\$3	\$3
B	5	10	12	6	10	6
C	7	14	12	6	12	6
Summation of prices	\$15	\$30	\$30	\$15	\$25	\$15
General price level – base t_0 (and reciprocal of value of money)	1	$2\left(\frac{30}{15}\right)$	$2\left(\frac{30}{15}\right)$	$1\left(\frac{15}{15}\right)$	$\frac{5}{3}\left(\frac{25}{15}\right)$	$1\left(\frac{15}{15}\right)$
Value of money – base t_0 (and reciprocal of the general price level)	1	$\frac{1}{2}\left(\frac{15}{30}\right)$	$\frac{1}{2}\left(\frac{15}{30}\right)$	$1\left(\frac{15}{15}\right)$	$\frac{3}{5}\left(\frac{15}{25}\right)$	$1\left(\frac{15}{15}\right)$

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[1] Statement 3, *Financial Statements Restated for General Price Level Changes,* of the Accounting Principles Board of the American Institute of Certified Public Accountants recommended in 1969, but did not make mandatory, the adjustment of financial statements for changes in the general price level. Note also the forthcoming study of the Accounting Standards Steering Committee of the Institute of Chartered Accountants in England and Wales on 'Accounting for Changes in the Purchasing Power of Money' and forthcoming study sponsored by the Canadian Institute of Chartered Accountants and authored by L. S. Rosen, 'Accountng for Changing Financial Values'.

can be used.[2] Introductory texts in statistics and economics touch on these problems.

Secondly, it is evident from a comparison between t_0 and t_1, that money at t_1 has only half the purchasing power of money at t_0 and that money at t_3 has twice the purchasing power of money at t_2. The relationship of the summation of prices of goods as between one year and another is therefore not only a commentary upon the extent to which the GPL has changed but also a commentary on the extent to which the value (the purchasing power) of money has changed. The GPL is, of course, inversely related to (i.e. the reciprocal of) the value of money. In Table 1 at t_1, the GPL is 2 and the value of money 1/2; at t_4, the GPL is 5/3 and the value of money 3/5.

Thirdly, if we assume a simple macro-economic model in which over the time period t_0 to t_5, economic resources are fully utilised, output of goods and services does not change, and the turnover of money does not change, then an exogenous change in the quantity of money changes the GPL proportionately and positively and the value of money proportionately and negatively. All time periods, excluding t_1 to t_2 in which there is no change in the quantity of money, illustrate this situation. In time period t_0 to t_1, the quantity of money has doubled, the price level therefore has doubled and the value of money has halved. Time periods t_0 to t_1 and t_2 to t_3 illustrate the situation in which the individual prices of goods do not change in relation to each other (for goods A, B and C in time period t_0 to t_1, $6:3=10:5=14:7$). Time periods t_1 to t_2, t_3 to t_4 and t_4 to t_5 illustrate the situation in which the prices of goods do change in relation to each other (for goods A, B and C in time period t_3 to t_4, $3:3\neq 10:6\neq 12:6$). In these latter three time periods, the prices of goods may change directly proportional with, or more or less than proportional with the change in the GPL (for goods B, C and A in time period t_3 to t_4, $10:6=25:15$, $12:6>25:15$ and $3:3<25:15$ respectively). Time period t_1 to t_2 indicates that the prices of goods can change in relation to each other without any change in the quantity of money and without any change in the GPL (for goods A, B and C, $6:6\neq 12:10\neq 12:14$).

Effects of price changes on accounting

The effects of price changes on accounting are pervasive. A firm's activities and financial position are measured in terms of money. Since money represents purchasing power over all other goods and since the purchasing power of money can change, it is apparent that the dimension of the measuring unit which accountants use is a changing one. The justification for GPL adjustments to financial statements flows from the desire to cancel out the effect of the changing dimension of the measuring unit. If net assets are acquired at time periods in which the dimension of the measuring unit is different from that of the present, a restatement for such differences is necessary and can be done by transforming the prices of the net assets into some common dimension of the measuring unit. That common dimension of the measuring unit may be either as of the present or at some point in the past. If the asset is being restated in terms of a common dimension at some point in the past, the transformation function is the value of money (restating asset C in Table 1 acquired at t_1 into the dimension of the measuring unit at t_0 is $14\times 1/2=7$). On the other hand, if the asset is being restated in terms of a common dimension as of the present, the transformation function is the reciprocal of the value of money or equivalently, the GPL ratio (restating asset C in Table 1 acquired at t_0 into the dimension of the measuring unit at t_1 is $7\times 2=14$). Generally speaking, relevancy at any particular point of time requires that the asset be restated in terms of the common dimension as of the present.

It is apparent from the assumptions in our simple economic model that the price of goods can change because of the particular supply and demand features that attend each good and/or because of the change in the dimension of the measuring unit that results from changes in the quantity of money in relation to all goods produced and sold. Distinguishing these two components of price changes can be done in the manner illustrated in Table 2.

Column 6 indicates the change to which GPL adjusted financial statements give effect. Column 7 indicates the specific price (SP) change (sometimes referred to as relative price changes) which GPL adjusted financial statements ignore. Financial statements adjusted for specific prices would include both the GPL change and the SP change. It is apparent from Table 2 that the GPL adjusted numbers need not necessarily coincide with the changes in individual prices. Only in the case of asset B does this occur. The adjusted GPL numbers therefore are not to be confused with specific prices. They are best understood as being a conversion into a measuring unit of common dimension. The specific price change can only be calculated after the GPL change has been determined.

Total changes in prices can therefore be analysed into their specific and GPL components. If GPL changes can be either positive, negative or nil and specific price changes be either positive, negative, or

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[2] See, for example, M. Hamburg, *Statistical Analysis for Decision Making* (New York: Harcourt, Brace & World Inc, 1970), ch 12.

TABLE 2

(1) Asset	(2) *Time period*	(3) *Price* *Opening*	(4) *Closing*	(5) *GPL conversion* *Opening price ×GPL ratio*	(6) *Change attributable to* *GPL (5)–(3)*	(7) *SP (4)–(5)*
C	t_3-t_4	6	12	$6\times\frac{5}{3}=10$	+4	+2
A	t_3-t_4	3	3	$3\times\frac{5}{3}=5$	+2	−2
B	t_0+t_1	5	10	$5\times\frac{2}{1}=10$	+5	0

nil, there are a total of nine possible combinations as shown by the matrix of Table 3. The assets in the various cells are from the data of Table 1. The changes in the specific prices and in the GPL are the changes which arise during the indicated periods.

Effect of price changes on monetary assets

We have assumed in the foregoing illustrations that assets A, B and C are all non-monetary assets. The conversion to GPL adjusted numbers is less simple when one of the assets being converted is the very unit of measurement itself – the *numeraire* – money. In this situation there must be a recognition of the price of money because all other assets are being converted into this one particular asset. In one sense, of course, because money is the numeraire, it reflects changes in its own dimension as they arise. However, if we wish to specifically point out the extent of this change we must go through the process of converting money for GPL adjustments in the same manner as we convert non-monetary assets. We must then give effect to the difference between this adjusted money figure and the price of the asset.[3]

Table 4 illustrates a situation wherein the asset A, now assumed to be money, and the non-monetary assets B and C are held through the general price rise that exists between time periods t_3 and t_4 of Table 1.

For all assets other than money, the GPL adjustment requires merely a transformation by the GPL ratio (for B and C, column (3)=column (6)); however, money not only requires this transformation but

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[3] These same kinds of adjustments are required of all net monetary items – that is items whose amounts are fixed by contract or otherwise in terms of numbers of dollars regardless of specific or GPL changes.

TABLE 3

	General price level change		
Specific price change	Positive	Nil	Negative
Positive	1 C (t_3-t_4)	4 B (t_1-t_2)	7 A (t_4-t_5)
Nil	2 A, B & C (t_0-t_1) B (t_3-t_4)	5 A (t_1-t_2)	8 A, B, C, (t_2-t_3) B (t_4-t_5)
Negative	3 A (t_3-t_4)	6 C (t_1-t_2)	9 C (t_4-t_5)

Cell 1 – GPL rises and price rises more than proportionately
Cell 2 – GPL rises and price rises in same proportion
Cell 3 – GPL rises and price either falls, remains constant, or rises less than proportionately
Cell 4 – GPL constant and price rises
Cell 5 – GPL constant and price constant
Cell 6 – GPL constant and price falls
Cell 7 – GPL falls and price rises, remains constant or falls less than proportionately
Cell 8 – GPL falls and price falls in same proportion
Cell 9 – GPL falls and price falls more than proportionately.

TABLE 4

	(1)	(2)	(3)	(4)	(5)	(6)
				attributable to Change		
	Prices of assets*		Restatement of t_3 price	GPL	SP	Complete restatement for GPL
	t_3	t_4	by GPL $\left(\frac{5}{3}\right)$	(3)−(1)	(2)−(3)	
A	1	1	$1\times\frac{5}{3}=1{\cdot}67$	+0·67	−0·67	1
B	6	10	$6\times\frac{5}{3}=10$	+4	0	10
C	3	6	$3\times\frac{5}{3}=5$	+2	+1	5

* Quantities of assets held are assumed to be different from those in Table 1.

also a transformation back to its price (1+0·67→1·67 −0·67→1). It is instructive to follow through the implied journal entries that give effect to the adjustments for money in GPL adjusted statements.

(1) Money (cash)	0·67	
Equity		0·67

To reflect GPL conversion of opening balances of equity in the balance sheet and money in the statement of calculation of monetary losses or gains.

(2) Equity (income)	0·67	
Money (cash)		0·67

To reflect the loss on holding money.

These entries offset each other completely so that it is appropriate to say that no GPL adjustments are needed whatsoever with respect to money. As mentioned previously, money because it is the standard of measurement, necessarily reflects changes in its own dimension as those changes arise. However, GPL adjustments do serve to restate non-monetary items in terms of a common dimension of the unit of measurement. On the other hand, GPL adjustments do not reflect (except coincidentally as in cells 2, 5 and 8 of Table 3) the specific prices that attach to non-monetary items.

The accounts of British holding company groups: development and attitudes to disclosure in the early years

J. Kitchen

'. . . accounting is a pragmatic trade . . .' [1]

'The history of company legislation shows the increasing importance attached to publicity in connection with accounts.'[2]

It is just about a half-century since the preparation of annual accounts for holding company groups began to occupy the attention of the accountancy profession in Britain. At that stage, at the beginning of the 1920s, the holding company group was still a relatively new phenomenon in this country, though it was already well established in North America, and was quickly to become here also the dominant form of organisation for large-scale business. Accordingly, the present seems an appropriate time to look back over the development of accounts for holding companies in Britain, not only because that development is, in itself, important and historically interesting, but more particularly because a consideration of its course and pace may imply lessons for the accountancy profession in the 1970s.

This article attempts to deal with the early years of development, beginning with Sir Gilbert Garnsey's celebrated lecture on 'Holding Companies and their Published Accounts',[3] delivered to the London Members of the Institute of Chartered Accountants in England and Wales[4] in December 1922. The article pays attention to what we may call relevant professional and business opinion at or about that time, and to the context in which it came to be formed, and follows developments relative to group accounts in Britain over the next few years.

The Garnsey lecture: aspects for consideration

It is beyond doubt that the Garnsey lecture of 1922 was central to the development of accounting for holding company groups throughout the period with which we are concerned. So, indeed, was Garnsey himself until his sudden and untimely death in 1932, when he was only 49. The 1922 lecture was a technical *tour de force* which made British accounting history, but its proposals did not prove generally acceptable to the accountancy profession and the business world in Britain for many years after 1922, despite the fact that groups involving holding and subsidiary companies were already numerous in this country by that date. Fifty years on, what perhaps surprises us is rather that forms of annual accounts appropriate for holding company groups had not been published in this country for a few years before 1922. This article is concerned to identify some of the probable reasons for the slow development in Britain.

Sir Gilbert Garnsey, KBE, FCA

It will be useful to look for a moment at the central character in this story. Gilbert Garnsey was born in 1883, and brought up in a large family of brothers and sisters. He attended Wellington School and became an articled clerk in 1900. He proved to be an accountant of exceptional brilliance, and was placed first in honours in the ICA/EW intermediate and final examinations of 1903 and 1905. He joined Price Waterhouse and Co as a clerk in 1905, and was admitted to a partnership in that firm in 1913.

When the Great War came, Garnsey volunteered for active service, but was rejected several times on account of his health. Instead, therefore, he sought to make a contribution to the war effort in other ways, and initially he served in an honorary capacity in the Finance Department of the Ministry of Munitions in 1916, later becoming successively Director of Internal

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[1] W. T. Baxter, in the preface to *Depreciation,* Sweet and Maxwell, London, 1971.

[2] Report of the Committee on Company Law Amendment (the Cohen Committee), 1945, Cmd. 6659, para. 96.

[3] Garnsey's lecture, given on 12 December 1922, appeared in full in *The Accountant* (issues of 6 and 13 January 1923).

[4] Hereafter ICA/EW for short.

Audits and Controller of Munitions Accounts, and then Chairman of the Finance Committee and Finance Member of the Munitions Council in 1918. In that year he received a knighthood for his war services, along with half-a-dozen other chartered accountants similarly honoured for similar work in other Services and Departments. Garnsey was then aged 35.

After the War, Garnsey, still a partner in Price Waterhouse, became amongst other things in 1919 a member of the Demobilisation Board, and of the Munitions Council in charge of the liquidation of contracts. He served on the Board of Trade Committee under the Profiteering Act of that year, and was Chairman of the Finance Committee of the Ministry of Health in connection with the Government Housing Scheme in 1919, and a member of the Rents Tribunal under the housing scheme regulations. He was a member of the Committees on the accounts of aerodrome construction works, 1919, and on the Metropolitan Water Board, 1920; Vice-Chairman of the Committee on Army Expenditure, 1922; a member of the Treasury Committee on the accounting methods of Government Departments, of the Board of Trade Committee on the Assurance Companies Acts, and of the Court of Inquiry into the remuneration of doctors under the National Health Insurance Acts, 1924. In 1925, he was appointed a member of the Government Food Council. He was Chairman of the Marketing and Distributing Consumable Commodities Committee of the Economic Advisory Council in 1930, and Chairman of the British Industries Fairs Sites and Buildings Committee in 1931. A few months before his death in 1932, he became a member of the Committee which had been set up by the Treasury in 1927 to simplify the income tax regulations.

In addition to all this public work, and to his day-to-day professional work, Garnsey often appeared as an expert witness in legal proceedings arising out of the affairs of companies. It was to him that, in 1929, the directors of the Hatry group came for assistance in unravelling the affairs of their companies when discovery of their frauds was imminent. He sorted out these complicated operations and was in the witness box for many hours. In connection with the trial of Lord Kylsant in 1931, he investigated the affairs of the Royal Mail Steam Packet Company for the Government. Besides all this, he was married and had a family life.[5]

It is clear that Garnsey was a prodigious worker, with a lively sense of public obligation and a quite remarkable capacity for absorbing detail and reducing complicated issues to manageable proportions. So far as his 1922 lecture on holding company accounts is concerned, it is possible that Garnsey over-estimated the capacity of many of his then professional fellows to do the same, and with hindsight we may wonder whether a less comprehensive first presentation using more deliberately simplified examples might not have proved more effective.

The ICA/EW had established a London Members Committee in 1921, and Garnsey was elected to be its Chairman in 1923, serving as such until 1926. His only predecessor in that office had been Mr William Cash, FCA, who had chaired the London Members Committee at the same time as serving as President of the ICA/EW itself from 1921 to 1923. Despite Garnsey's record and prominence he was not elected to membership of the Council of the ICA/EW until 1928.[6] Mr Cash, in 1925, became a member of the Committee on Company Law Amendment (the Greene Committee) which the Board of Trade set up in that year. The 'Accounts of holding companies and their subsidiaries' was a heading, specifically listed by the Committee in the document they issued to indicate the problem areas which would engage their attention and to invite evidence from interested persons and institutions. At our distance in time, we may well feel surprise that Garnsey was not amongst those who gave evidence to the Greene Committee.

Although, as a partner in Price Waterhouse with a brilliant record of public service, Garnsey was 'of the purple', we may guess that his relative youth, and his association over a number of years with civil servants and governmental and quasi-governmental institutions and inquiries, made him something less than perfectly acceptable in the early 'twenties as a man able to speak for the accountancy profession, at least in the eyes of its more traditionally minded members.

Publicity attending the Garnsey lecture

For whatever reasons the Garnsey lecture of 1922 failed initially to persuade the accountancy profession and British businessmen to the point of action, it was not for lack of publicity. As was customary for important lectures, the previous issue of *The Accountant*[7] included an editorial 'Weekly Note' giving information about the forthcoming lecture, adding: 'If time permits, a discussion will follow.' The lecture ran to something of the order of 20,000 words and several closely printed pages of examples, but *The Accountant* reproduced it all in its issues of 6 and 13 January 1923, and for good measure included an editorial by way of introduction in its 6 January issue.[8] The London Members, who not surprisingly lacked the time (and the stamina) to discuss the lecture on the evening of its presentation, took the unusual step of meeting a second time, on 16 January 1923, for their discussion, and notice of this was given in *The Accountant* of 6 January.[9] Unfortunately, what was said on 16 January does not seem to have survived. But Sir Gilbert published the lecture in book form[10] soon afterwards, and recorded in the preface (dated September 1923) that he had distributed privately some 1,000 copies of the lecture to members of the Institute and friends.

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[5] *The Times*, 28 June and 1 July 1932. *The Accountant*, 2 July 1932.

[6] There may have been institutional reasons for this, as there were other members of his firm on the Council.

[7] *The Accountant*, 9 December 1922, p. 833.

Following the 1929 Companies Act, Garnsey published a second edition of his book in July 1931; and after his death, his fellow partner in Price Waterhouse, Mr Thomas B. Robson,[11] published a third edition in 1936. The second and third editions incorporated the original and some additional material without major change beyond what was needed to recognise the 1929 legislation. When Garnsey died, *The Accountant's* obituary article referred to his book on holding companies' accounts as 'the standard work on that subject'[12] and when Sir Harold Howitt wrote the History of the ICA/EW in the mid-1960s, he echoed that phrase with reference to the period prior to the Second World War.[13]

Yet, Mr T. B. Robson, who brought out his own book on 'Consolidated and Other Group Accounts' in 1946, after the Cohen Committee Report of 1945, and after the publisher's stocks of the Garnsey 3rd edition had been destroyed by enemy action, was still moved to say, in opening his first chapter, and speaking of Garnsey's lecture on consolidated accounts for holding companies:

> 'In 1922, (the) idea was novel to business men in this country and in large measure they reacted at first with indifference or opposition.'[14]

Sir Gilbert himself, referring to the British situation in the 1931 edition of his book (pp. 102–3) was content to say:

> 'Since ... 1923 considerable progress has been made in this country in the common appreciation of the value of consolidated statements and the publication of such statements to supplement the legal balance sheet is much more general ... Perhaps the real opposition to any but the most essential changes in the form of the published accounts often comes from boards of directors who are not all imbued with the desire to give their shareholders as much information as possible. In some cases they no doubt have in mind (and rightly so) the necessity for avoiding disclosure of information which might conceivably be of use to competitors. Moreover, in view of the fact that the shares in the industrial concerns of this country are generally very widely distributed ... the call for consolidated accounts has never been insistent. Shareholders perhaps can hardly be expected to know what form of accounts they require but in recent years there has been a demand for more information concerning the position and results of subsidiary businesses.'

The economic and social context: company mergers in the years before 1922

From the early years of the Great War, there had been a marked increase in the number and range of business combinations and amalgamations in Britain, with the pace becoming more rapid during the later years of the war, and during the brief post-war boom of 1919/20. And it was during this period of half-a-dozen years before 1922 that holding company groups emerged as an important form of business organisation in this country. There had been an earlier movement towards combination, particularly towards the end of the nineteenth century in Britain, and into the early years of the twentieth, but at that stage the holding company type of merger does not seem to have played a significant part.

The combinations and amalgamations which occurred during the War, and in the days of shortage of materials and manufactures of all kinds which followed it, gave rise to a great deal of public anxiety, and this factor is of importance as regards the present paper in so far as it throws light on the likely attitudes of industrialists and business men in the early 1920s to proposals for increased disclosure of financial information by companies.

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[8] *The Incorporated Accountants' Journal* (*Accountancy* since 1938) also ran an article on the lecture in its issue of February 1923 (pp. 110–12).

[9] *The Accountant*, 6 January 1923, p. 6.

[10] *Holding Companies and their Published Accounts*, Gee & Co, London, 1923.

[11] President of the ICA/EW from 1952–53, and Sir Thomas from 1954.

[12] *The Accountant*, 2 July 1932, p. 9.

[13] *The History of the Institute of Chartered Accountants in England and Wales, 1880–1965*, Heinemann, London, 1966, p. 79.

[14] T. B. Robson, *Consolidated and Other Group Accounts*, 1st edn, Gee & Co, London, 1946. There have been three subsequent editions, the latest (with S. M. Duncan) in 1969. The following reference in the preface to Robson's second edition to Sir Arthur Lowes Dickinson, who headed Price Waterhouse's New York Office, from 1901 to 1913, is interesting. Robson says of Sir Arthur that he

'was instrumental in initiating the movement which led to the general use of consolidated accounts by holding company groups in North America.'

Robson continues:

'Sir Gilbert Garnsey was the first to enunciate publicly in Great Britain the principles applicable to group accounts when the use of the holding company method of business organisation became of importance in this country...'

A Committee on Trusts had been appointed in February 1918, and reported the following year,[15] its concern being with an 'increasing tendency . . . in every important branch of industry in the United Kingdom . . . to the formation of trade associations and combinations, having for their purpose the restriction of competition and the control of prices'. The Committee also drew attention (in addition to referring to various forms of association of independent firms) to 'an increasing number of great consolidations: some horizontal . . . and some vertical . . .', instancing industries such as iron and steel, engineering, the chemical industry, the electrical industries, soap, tobacco, wallpapers, salt, cement, and the textile trades 'where there are powerful combinations or consolidations of one or other kind which are in a position effectively to control output and prices'. The Committee were 'unanimously of the opinion that it would be desirable to institute in the United Kingdom machinery for the investigation of the operation of monopolies, trusts, and combines, similar to the Commissions and other tribunals created for that purpose in the USA . . .' and certain other countries to which they referred. Mr Bevin, Mr Hobson, Sidney Webb, and another member of the Committee, Mr W. H. Watkins, also signed a minority report pointing out that in their view, the proposals of the main report fell short of what was necessary to safeguard the public interest.

A few months later, as prices continued to rise, the House of Commons set up a Select Committee on High Prices and Profits which met to take evidence for the first time on 5 August 1919. The next day, the Government announced that it would bring in legislation to check profiteering[16] and a large number of detailed enquiries, some searching and some less so, followed under the Profiteering Acts 1919 and 1920. A Central Committee was appointed under the Acts, with three Standing Committees, to investigate Prices, to investigate the operations of Trusts, and to deal with complaints. To the first two Committees, some fifty or more reports were submitted during 1919, 1920 and 1921 before the powers under the Acts came to an end. Each of these reports dealt with a particular trade or range of products, in most cases products entering into direct consumption though not exclusively so. Each report represented the findings of a separately appointed Sub-Committee, often including an accountant, and a great number of these investigations were in process at the same time.

Directors of large undertakings and their chief managers appearing before such tribunals inevitably found themselves on the defensive, irrespective of whether their past actions or future intentions were justifiable. Yet only a few years earlier (as *The Economist* was to admit in a series of four useful articles published at the end of 1923)[17] there had been a wide consciousness in government and among industrialists in Britain, that concentration and integration had not gone nearly so far in this country as in the United States and Germany:

> 'There were many . . . who believed that only by the remodelling of our own organisation on . . . the lines adopted in the two countries which . . . seemed likely to be our chief competitors could British industry hold its own in the post-war struggle. This belief found expression particularly in the reports of the various committees constituted by the Board of Trade to consider the probable position of various staple industries after the war . . .'[18]

But in 1923, *The Economist* (whose interest it was, as always, to promote the effective control of Trusts without losing the benefits of concentration) was concerned, amongst other things about the then current labour troubles in industry, and saw the 'danger of exploitation by monopolies' as something needing to be removed –

> 'it is clear that until something is done to remove this suspicion (of exploitation) the road to industrial goodwill and confidence is blocked.'[19]

This was *The Economist's* reason for commissioning the preparation of the articles 'by a highly qualified expert' (who remained un-named). For our part, we may usefully note that the articles, in addition to commenting on the spread of looser forms of combination, referred specifically to a number of company amalgamations in the iron and steel industries, in the armament and associated engineering industries, in the electrical industries, and in the chemical and allied industries, as well as in steel products, lead manufacture, photographic materials, textiles, the glass bottle industry, and the food trades, particularly confectionery, biscuits and milk.

Nearly all the groups named in *The Economist* articles had been formed by amalgamations, or greatly expanded by acquisitions, between the years 1915 and 1921. They included The United Steel Companies Ltd, Baldwins Ltd, Guest, Keen and Nettlefold, John Summers and Sons, and Dorman Long and Co; Vickers Ltd, Armstrong Whitworth, and BSA; the English Electric Company and the General Electric Co; Brunner Mond & Co, and Nobel Industries (later to merge with others to form ICI Ltd), and Lever Brothers Ltd; Sheffield Steel Products Ltd, Associated Lead Manufacturers Ltd, British Glass Industries Ltd, the British Cocoa and Chocolate Co Ltd (formed to acquire control of Cadbury Brothers and J. and S. Fry & Sons), the Associated Biscuit Manufacturers (formed to acquire Huntley and Palmers and Peek Freans) and the United Dairies Ltd, to list no others. In nearly all the groups or principal companies named, some of the acquisitions made had been of controlling interests obtained by purchase of less than 100 per cent of the share capital of the acquired undertakings.

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[15] The Committee was appointed by the Ministry of Reconstruction. The members included Ernest Bevin, J. A. Hobson and Sidney Webb.

[16] Report of the Select Committee on High Prices and Profits, House of Commons Paper 166 of 1919.

[17] *The Economist*, 22 December 1923 to 12 January 1924.

[18] *Op. cit.*, p. 1096 (22 December 1923). The Committees here referred to were Departmental Committees which sat during the last years of the war, and were not those appointed under the Profiteering Acts.

[19] *Op. cit.*, p. 1095, 22 December 1923.

Garnsey's general line of approach in 1922[20]

It is fortunately unnecessary, in this paper, to attempt any kind of comprehensive summary of the content of Garnsey's 1922 lecture on Holding Companies and their Published Accounts. Though recognition was delayed, the methods Garnsey advocated were eventually accepted. The ICA/EW Recommendation of 1944 on 'Disclosure of the financial position and results of subsidiary companies in the accounts of holding companies'[21] – which was effectively the basis of the Cohen Committee's recommendations of 1945 – and the notes by the Taxation and Research Committee of the ICA/EW on 'Group Accounts in the form of Consolidated Accounts', issued in May 1949, were essentially in line with Garnsey's lecture of more than a score of years earlier.

Nevertheless, some reference to Garnsey's general line of approach in 1922 will not be out of place. He put forward 'roughly speaking, four methods of presenting the accounts of Holding Companies', as follows:

> *Method I:* To publish only the Holding Company's balance sheet and profit and loss account, showing the interest in subsidiary companies as an investment . . . 'including in the profits the dividends actually received from the subsidiary undertakings.' (Garnsey noted that the 'total profits and/or losses of the subsidiary undertakings are sometimes taken up in the Holding Company's balance sheet and profit and loss account irrespective of what dividends are actually declared and paid'.)[22]
>
> *Method II:* To publish the balance sheet and profit and loss account of the Holding Company (as in I), and to present simultaneously the separate Balance Sheets and Profit and Loss Accounts of all the subsidiaries.
>
> *Method III:* To publish the balance sheet and profit and loss account of the Holding Company (as in I), and to present simultaneously 'as a separate statement a summary of the assets and liabilities of all the subsidiary undertakings taken together'.[23]
>
> *Method IV:* To publish 'either separately or along with' the Holding Company's balance sheet (as in I) 'a consolidated balance sheet of the whole undertaking amalgamating the assets and liabilities of all the subsidiaries with those of the Holding Company and a consolidated profit and loss account embracing the profits and losses of all the companies'.[24]

Garnsey's references to profit and loss accounts (including, in Method IV, a consolidated profit and loss account) should be noted.

It will be observed that in Method IV, Garnsey was less than categoric about the necessity in every case to provide separately the 'legal' balance sheet of the Holding Company. This was later to prove of importance, though Garnsey's view (that Method IV should preferably include the Holding Company's legal balance sheet submitted as such) was never in doubt.[25]

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[20] For convenience, quotations from Garnsey's lecture in this article are identified by reference to page numbers in the 1923 edition of Garnsey's book, which was for practical purposes a reprint of his lecture.

[21] Recommendations on Accounting Principles: No. VII, dated 12 February 1944. This Recommendation was rendered obsolete by the group accounts requirements of the Companies Act 1948, and its demise was noted by the ICA/EW, when the Recommendations were reprinted for inclusion in the Members' Handbook in 1958.

[22] *Holding Companies and their Published Accounts,* 1923 edition, p. 13.

[23] *Op. cit.,* p. 14.

[24] *Op. cit.,* p. 15.

[25] Thus, *op. cit.,* p. 60, in Garnsey's section dealing with Method IV:

> 'On the whole it is better to submit the amalgamated (i.e. consolidated) balance sheet as supplementary information to the so-called legal balance sheet of the Holding Company so that shareholders can see the financial position of the Parent Company in its relationship to shareholders and creditors and also the combined results as a single organisation.'

and also (p. 60):

> 'The consolidated balance sheet is seldom published alone in this country, no doubt for the reason that it is not regarded as the legal balance sheet.'

and earlier (p. 17):

> 'From the creditors' point of view, a balance sheet prepared in this way (i. e. the legal balance sheet setting out only the actual assets and liabilities of the Holding Company) is essential to enable them to form an opinion of the financial condition of the company against which they would have to proceed if occasion arose.'

In this paper, we are basically concerned with the development of the attitudes of accountants and business men to the disclosure (to shareholders, creditors and the public) of financial information about business undertakings. It is of importance, therefore, to consider Garnsey's position in this respect.

Garnsey outlined the normally accepted advantages of consolidation very briefly at the start of his lecture, introducing the holding company form of organisation by reference to 'the necessity for not disturbing the organisation of existing companies . . . for preserving the names and goodwill of businesses of reputation'[26] and so on. With prices falling disastrously as they were in 1921 and 1922, it is not surprising that Garnsey should also mention 'the elimination of ruinous competition' among the general advantages of amalgamation and consolidation.[27] However, he went on,

> 'On the other hand it has its dangers, such as the possibility of monopoly, fraudulent promotion and management, complexity of company organisation, and, consequently, a tendency to obscure results and thus deceive shareholders as to the real value of their holdings.
>
> 'This applies particularly to concerns which are controlled by means of a Holding Company. . . .'[28]

He also referred to the rights, and the danger of oppressive treatment, of minority shareholders.

Referring to Method I (to publish only the holding company's balance sheet and accounts) Garnsey said:

> 'One of the advantages attaching to the Holding Company's balance sheet in the separate or legal form is that it is all that is legally necessary for the directors to publish.
>
> 'Some might say that this is a distinct disadvantage, because directors should be induced to disclose to shareholders as much information as possible not only in connection with the concern in which they are directly interested but also of the subsidiary companies in which their interest is just as great although it may be indirect. While there is a lot of truth in this it is also true to say that the legal balance sheet enables the directors to prevent the disclosure of vital information to competitors regarding their interest in subsidiary undertakings. Further it admits of the equalisation of the income of the parent company from one period to another by the retention of undistributed profits in the accounts of the subsidiaries.
>
> 'There is no doubt that the question of disclosure to competitors is of considerable importance and is often the deciding factor against any change in the form of the published accounts. Shareholders as a rule are quick to appreciate the dangers attending a too full statement of the affairs of their company and rely to an almost unlimited extent upon the advice tendered to them by their Board.
>
> 'On the other hand, cases are not unknown where directors, looking for an excuse, seize upon this to furnish their shareholders with as little information as possible. Shareholders, however, are now beginning to understand and to ask for more details, and experience has shown that it is all to the good to give it to them if it can be done without injury to the company's vital interest.'[29]

Garnsey then referred to 'a recent meeting of a well-known limited company' where the Chairman had spoken of interests in subsidiaries included in the legal balance sheet at £17,334,564, and had gone on to give further information to shareholders. Garnsey did not name the company, either in his lecture or in his book, but it was in fact Nobel Industries Ltd, and a further reference to this company will be made later in this article. Garnsey was speaking[30] in strong approval of the Chairman's expressed desire, quoted in the report of the Company Meeting, and repeated by Garnsey:

> '. . . that shareholders should have the fullest possible information as to the real position and know what actually constitutes their assets.'

Garnsey went on:

> 'It is doubtful whether the legal balance sheet, as usually seen nowadays unaccompanied by any further particulars concerning the general position of the allied undertakings, really gives the shareholders the information to which they are entitled . . . it is a method which is open to criticism from the point of view of an investor and lends itself to abuse in the hands of an unscrupulous management. . . . With some companies it can certainly be said that the legal balance sheet does not show the true position

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[26] *Op. cit.*, p. 3. Garnsey also dealt later (at pp. 6 and 7) with another advantage of the holding company form of amalgamation, which, with hindsight, we may consider to have been the over-riding advantage in the years before 1922, namely the opportunity it provided (compared with a direct amalgamation) of retaining prior charge capital (preference shares or debentures) issued at advantageous rates.

[27] See, for example, *Abstract of British Historical Statistics*, Cambridge University Press, 1962, which gives figures (p. 477) for the Board of Trade Wholesale Price Index, amongst others; for the period as under (1913=100):

1920=307·3 1921=197·2 1922=158·8

[28] *Op. cit.*, p. 4.

[29] *Op. cit.*, pp. 18–19.

[30] Garnsey's actual words were: 'This is worthy of special mention as one of the few cases of its kind in this country – a precedent which it is hoped will be followed by all similar concerns in the future.' *Op. cit.*, p. 20.

of the Holding Company and gives little or no information of the consolidation as a whole.

> 'It is submitted that in every such case where it is clear that the Holding Company's balance sheet does not of itself give a full and fair statement of the position . . . then it should be supplemented either by an aggregated statement of the assets and liabilities of all the undertakings, including the Holding Company, or by a statement of the total assets and liabilities of all the subsidiary enterprises, whichever may seem the more appropriate for the occasion.'[31]

These sentiments were not to recommend themselves as appropriate for statutory provision to the Company Law Amendment Committee which was appointed in 1925, nor were they to receive general approval for a number of years thereafter. We should, however note that in relation to the legal balance sheet of the parent company, the 1926 Report of the Greene Committee and the subsequent legislation was to follow up Garnsey's anxiety that the legal accounts should indicate

> 'how far the position has improved or changed for the worse . . . (since acquisition) . . . that is to say whether, taking them as a whole, there are profits (of subsidiaries) still undistributed or losses (of subsidiaries) unprovided for by the Holding Company.'

Garnsey, nevertheless, took the matter more seriously than the Greene Committee were to do, and made it clear that in his view a consolidated balance sheet should be prepared,

> 'whether (it) is intended to be published or not . . . (to) enable (the) auditor to get a correct view of the business as a whole and to decide what, if any, adjustments are necessary or qualifications desirable before the Holding Company's balance sheet is certified.'[32]

It may be worth noting that Garnsey indicated in 1922 some overall preference for Method III, and that he discussed in relation to this Method and also to Method IV a number of 'preliminary matters requiring consideration', among which (in addition to the need for the accounts of the various companies to be made up to the same date) Garnsey included the need for the companies' assets to be uniformly classified, and their values computed on the same basis.

From all the foregoing, Garnsey emerges as a progressive in terms of his inclinations towards disclosure, looking to accounts designed to give shareholders a full and fair idea of group performance, and as full and fair an idea as possible of the group's financial position in terms of assets and liabilities, if practicable through the legal balance sheet (by allowing where necessary for undistributed profits or losses of subsidiaries) or preferably by the provision of information supplementary to the legal balance sheet to convey the same impressions with more adequate detail. Garnsey was, however, conscious of the need to protect his firm and his partners. He must have felt he was not in a position to commit himself absolutely, and he included a caveat at the end of the introduction to his lecture:

> 'It is perhaps desirable . . . to state that while certain views may be expressed in this paper they are put forward having regard to the facts and circumstances set out, and it should be understood that the writer feels himself open to adopt a different point of view where the facts are not identical or where the circumstances appear to warrant a different treatment . . .'[33]

The economic and social context: attitudes to disclosure and some cases in point

(a) *Businessmen and the law in Britain: some relevant aspects*

The companies legislation of 1907/8 had, for the first time since the introduction of general registration of companies with limited liability in 1855, required the compulsory filing, each year, of a 'statement in the form of a balance sheet' by all save private companies. In the reports of the Loreburn Committee on Company Law Amendment of 1906, and the earlier Davey Committee of 1895, the primary concern on disclosure had been with the interests of creditors and 'the trading public'. The 1908 Act specifically stated that the balance sheet 'need not include a statement of profit and loss'.[34]

As regards members, there had been a general view since the mid-nineteenth century 'that matters of accounting should be dealt with by private contract between shareholders and directors'. The companies legislation of 1856 had accordingly relegated accounting and auditing clauses to a set of model Articles of Association, which became Table 'A' in later Acts. Special legislative provision had been made subsequently for banking and insurance companies. The audit requirements prescribed in the 1900 Act inferred an obligation to prepare an annual balance sheet, but the 1900 Act made no specific provision. In general, however, prior to 1908, companies seeking a Stock Exchange quotation were likely in normal times to adopt the model Articles to increase the marketability of their shares, and the model Articles included references to a 'Statement of the Income and Expenditure' and a 'just Balance of Profit and Loss' to be laid before the Annual General Meeting.[35]

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[31] *Op. cit.*, p. 20.

[32] *Op. cit.*, p. 33.

[33] *Op. cit.*, p. 2. This caveat appeared in the 1923 edition of Garnsey's book, but not in later editions.

[34] Section 26.

During the same period there developed among business men and investors an increasing tendency to think of the profit figure as setting an upper limit to dividend payments, and since these had to be made in cash, directors and accountants were inclined to an 'exercise of accounting discretion or judgement . . . conditioned in general by an approved bias towards "conservatism" '[36] in the assessment of profits. Thus, assets 'were to be under- rather than over-stated; and possible losses . . . anticipated rather than deferred . . . while . . . gains [were] to be deferred until . . . realised'.

The creation of secret (or inner) reserves took this process 'well beyond the caution characteristic of ordinary accounting conservatism. Provided it was done in good faith and in the interests of the company, the directors could, within wide limits, present final accounts embodying deliberate and material deviations from the application of the accounting conventions . . . profits, and hence net assets, could be under-stated . . . without shareholders being made aware of the approximate magnitude of the undisclosed reserves . . . Moreover, if it was considered in the interests of the company, reported profits in later, leaner years could be augmented by drafts on the undisclosed reserves.' The employment of secret reserves had become an 'important feature of company accounting in the second half of the nineteenth century . . .'[37]

The exclusion of a 'statement of profit and loss' from the balance sheet to be filed under s. 26 of the 1908 Act, mainly reflected an anxiety that information on profits would be of potential value to competitors. There were, however, indications that business opinion against disclosure of profits had if anything been hardening in the years since 1908. The Company Law Amendment Committee appointed in 1918 under the chairmanship of Lord Wrenbury was very forthright in its opposition:

> (With regard to s. 26 of the 1908 Act) 'We have made enquiry whether a profit and loss account ought to be included. We do not recommend that it be required. As a commercial matter publication of profit and loss ought not to be required in the absence of a very strong reason, and we do not find that such reason exists. To require from a corporation a public disclosure of profit and loss which is not required from a firm or an individual, gives an unfair advantage to a competitor in trade and does not commend itself to our judgement . . .'[38]

That the Committee were expressing views which were bound to be considered authoritative is clear when we recall that Lord Wrenbury was the former Buckley, L. J. Henry Burton Buckley's famous book on company law had been regarded as a standard work since it first appeared in 1873, and it has been said still to have held first place in its successive editions which continued to appear until 1930, a few years before Buckley died.

Buckley himself had been regarded as one of the most learned and capable members of the Chancery Bench from 1890, specialising in company work, and he had been the senior Chancery Judge when he was made a Lord Justice of Appeal in 1906. He was raised to the peerage on his retirement in 1915. Buckley had been a member of the Davey Committee on Company Law Amendment which had reported in 1895. His authority and reputation could hardly have been more firmly established.

Buckley is famous in British accounting history as the Judge who said, in 1906, in an observation made in the course of his judgement in the case of Newton vs. Birmingham Small Arms Co Ltd (2 Ch 378: 22 TLR 664):

> 'The purpose of the balance sheet is primarily to show that the financial position of the company is at least as good as there stated, not to show that it may not be better.'

This view, which was very much in line with the sentiment of the times, formidably supported the bona fide use of secret reserves. It received much publicity, and was widely quoted in the years prior to the Kylsant case of 1931. It seems to us now a curious thing that Sir Owen Philipps, KCMG MP, who received a peerage in 1923, taking the title of Lord Kylsant, should have been one of the members of the Wrenbury Committee, which also included (amongst others) two Scottish chartered accountants, a former President of the ICA/EW – Sir William Plender, as he then was, of Deloittes – and Mr James Martin, later to become Sir James and to be twice President of the Society of Incorporated Accountants and Auditors.

At the end of the Great War, it was common form in accounting textbooks to find a warning against secret reserves because they lent themselves to manipulation, but almost without exception secret or inner reserves used in good faith were, in the same textbooks, considered in greater or less degree desirable.[39]

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[35] H. C. Edey and Prot Panitpakdi, 'British Company Accounting and the Law: 1844–1900', published in *Studies in the History of Accounting*, eds. A. C. Littleton and B. S. Yamey, London, Sweet and Maxwell, 1956, p. 361 *et seq.*

[36] B. S. Yamey, 'Accounting in England, 1500–1900', published in *Studies in Accounting Theory*, eds. W. T. Baxter and S. Davidson, London, Sweet and Maxwell, 1962, p. 42.

[37] Ibid.

[38] Report of the Company Law Amendment Committee 1918: (the Wrenbury Committee), Cd. 9138 of 1918, para. 60. The Wrenbury Committee's terms of reference were 'to enquire what amendments are expedient' in the Companies legislation 'particularly having regard to the circumstances arising out of the war and of the developments likely to arise on its conclusion . . .'

This was also the general view of accountants though some held it with less enthusiasm. Lawrence Dicksee, who was the part-time holder of the first chair of accountancy at the London School of Economics from 1919 to 1926 said in a public lecture in 1920.[40]

> '. . . the practice has grown up, and during recent years appears to be decidedly on the increase, of piling up what are . . . called . . . "secret reserves".
> The term . . . does not appear to be much used save by those who oppose this particular . . . policy and regard it as . . . highly undesirable.'

After a discussion referring, *inter alia,* to the heavy burden which the auditor bore of determining whether he should make any disclosure to the shareholders, and where he did not, satisfying himself that the directors were acting in good faith, Dicksee went on:

> 'We cannot, and ought not to, complain, but rather to congratulate them [the directors] if their general policy is always to be on the safe side . . . In spite of . . . this, we must draw the line somewhere, or we shall find that we are driven to the conclusion that the balance sheet may mean little or nothing . . .'

Dicksee then quoted 'a shipping company having total assets amounting to £1,305,000 odd, [which explained] £1,073,811 of that amount by simply describing it as "Stock in steamships and investments, book value at 31 December 1918, after deducting depreciation previously written off" '. He recounted that at the company meeting, the Chairman had been asked by a shareholder to say how much of the £1,073,811 represented steamships and how much investments. The Chairman replied that it was not in the interests of the company to give that information. Dicksee added:

> 'At the time the £10 shares of the company stood at about £45. A little later the ships were sold and the company was wound up, and the return to the shareholders is now expected to be about £130 per share. One wonders whether it really was in the interests of the company that shareholders should have no information which would suggest to them that their shares were worth a very great deal more than the current market price.'

Dicksee also complained of another practice, then popular, which disclosed and at the same time concealed information, namely the grouping of a number of miscellaneous assets together under one head. Thus, said Dicksee, a well-known company explained an outlay of upwards of £5¾ million sterling as follows:

> 'Land, water rights, reservoirs, effluent works, buildings, plant, machinery, office furniture, goodwill, designs, engraving and sampling per last account £5,776, 212 19s 8d.'

Dicksee thought this 'not an ideal way' of disclosing what the company resources consisted of.

Events were to show that there would be no real advance in the standard of published accounts (including the published accounts of holding company groups) until the setting up and use of secret reserves had ceased to command the wide approval of businessmen. It is also significant that when the great step forward came, in the early 1930s, it involved also a new attitude to the disclosure of profits.

(b) Holding Companies in the USA

In his 1922 lecture, Garnsey noted that the consolidated balance sheet 'is now almost universally adopted' by holding company groups in the USA.[41] He dated this practice from the formation of the United States Steel Corporation in 1901, noting also that 'the practice had [at first] little support except from accountants'.[42] However, for some years before 1922, the New York Stock Exchange in connection with applications to list securities had required first the filing of balance sheets for each individual constituent company, and later ('for some years now') consolidated balance sheets. The Federal Reserve Board had also from time to time advised that corporations having large interests in subsidiaries did not provide an 'adequate basis for consideration' when applying for credit unless a consolidated balance sheet or the equivalent was submitted.[43]

Doubtless Garnsey had some of his information about accounting practice in regard to holding companies in the United States from Sir Arthur Lowes Dickinson, who had headed the Price Waterhouse New York office from 1901 to 1913, and had joined the London firm in that year, the same year in which Garnsey became a partner in PWs. Dickinson became a member of the Council of the Institute in 1914, and Garnsey was eventually elected to that body in his place in 1928 when Dickinson (who retired in 1923) resigned from the Council.

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[39] See, for example, the fourth edition of Spicer and Pegler's *Book-keeping and Accounts,* 1919, pp. 59–60.

[40] Reproduced in *The Accountant* for 20 November 1920, pp. 561–4.

[41] *Op. cit.,* p. 57.

[42] Ibid. Referring to Britain, Garnsey said: 'The merits of the consolidated account are hardly known or appreciated here outside the ranks of accountants and the natural reluctance of the people of this country to change is too well known to require any comment.' (p. 59.)

[43] *Op. cit.,* p. 58.

Sir Arthur Lowes Dickinson gave a lecture to the Royal Statistical Society in 1924[44] in which it is interesting to note that he advocated the dissemination of more information 'as to the financial position of our staple industries' as a possible means of improving confidence and understanding between labour and capital, then causing much concern. It had been the objective of *The Economist* articles of December 1923/January 1924, already quoted, to take a similar line. Of direct relevance to this paper were some brief remarks Dickinson made in the course of his lecture on accounting practice in the United States in comparison with Great Britain, e.g.

> 'In the United States the almost universal practice for more than fifteen years past has been [for holding company groups] to publish a consolidated statement of the earnings, and a consolidated balance sheet aggregating the assets and liabilities of all the subsidiary companies . . . The practice in Great Britain is in its infancy, and only a few concerns have yet adopted it . . .'

Of the situation in Britain, Sir Arthur said:

> 'One obstacle to the general adoption of the principle of the consolidated balance sheet is that in the present state of the law it is not the legal Balance Sheet of the company, and it is consequently necessary to prepare and file the ordinary balance sheet as well as the more accurate consolidated one.
>
> 'In the US this difficulty does not arise, as there are no statutory provisions as to the form of balance sheet for ordinary commercial companies, nor are they required to be published . . .'[45]

He added, speaking of the US and Britain,

> '. . . it may be said that generally the practice in both countries has been in the past, *and appears to be still more so in the present,* to reduce rather than to increase the very inadequate information which is given with regard to earnings and costs.'[46]

(c) Non-disclosure and amalgamations

Remarkably little material on the subject of amalgamations appears in the British accountancy periodicals in the years around 1922. A noteworthy exception is the reproduction in *The Accountant* of 3 January 1920,[47] of a lecture by A. E. Cutforth[48] under the title 'Amalgamation Schemes: from an Accountant's Point of View'. This was a relatively early public indication of a technical interest in amalgamation schemes which Mr Cutforth seems to have had through the greater part of his career.

From the point of view of this paper, it will suffice that we should note that Cutforth dealt with three methods of merger – one temporary and two permanent (i.e. profits pooling schemes, direct amalgamations, and holding company schemes) and that he discussed at some length, as the chief advantage of the holding company scheme, the facility of being able to retain the benefit of fixed interest prior charge capital issued 'at what are today regarded as low rates of interest'.

Mr Cutforth published a book on methods of amalgamation in 1926,[49] opening his preface with the remark:

> 'No book on the subject of Amalgamations appears to have been published in this country, although many amalgamations of industrial and other concerns have taken place within recent years . . .'

Again, from the point of view of this paper, our interest in Mr Cutforth's book is not direct, but a reference to it serves to make the point that amalgamations were, as late as the mid-twenties, an area in which public discussion was still very sparse, and also to establish Cutforth's authority in the field.

Mr Cutforth produced another book in 1930[50] entitled 'Public Companies and the Investor'[51] and in a chapter on 'Combines owned or controlled by public companies' referred to Holding Company groups, outlining the disclosure requirements of the 1929 Companies Act, and adding:

> 'As a matter of fact, it has occasionally been the practice for Holding Companies to go a step further, and to issue for the information of their shareholders a consolidated balance sheet in which the assets and liabilities of the various subsidiary companies are combined . . . with the assets and liabilities of the Holding Company'[52]

Mr Cutforth had earlier noted, in reference to the requirements of the 1929 Act, that it was 'unnecessary for the actual names of the subsidiary companies to be disclosed'.[53] At the end of his chapter, contrasting a holding company scheme with a complete amalgamation he says:

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[44] 'Publicity in Industrial Accounts', *Journal of the Royal Statistical Society*, 1924, pp. 391 *et seq.*

[45] The one notable direction in which Garnsey's book of 1923 differed from his 1922 lecture was in its inclusion of an Appendix in which Garnsey reproduced, with permission and without comment, the published Balance Sheets and Accounts of a number of large companies with material holdings in subsidiaries. These examples included American and (in later editions) European companies. In the three editions, accounts in consolidated form for US companies appeared on 16 occasions; in two of these cases parent company 'legal' balance sheets were also included.

[46] My italics.

[47] pp. 11–24. The lecture was given to the Chartered Accountant Students' Society of London, on 22 October 1919.

[48] President of the ICA/EW from 1934 to 1936, and Sir Arthur from 1938. Cutforth was born in 1881, and had become a partner in Deloittes in 1912.

[49] *Methods of Amalgamation*, G. Bell & Sons Ltd, London, 298 pp.

[50] He was, of course, also the author of a well-known textbook on 'Audits', and had published other works.

[51] G. Bell and Sons Ltd, London, 293 pp.

[52] *Op. cit.*, pp. 171–72.

> 'Under a Holding Company scheme, knowledge of the merging of interests will not be so widespread, as each of the companies continues to operate under its own name; indeed, it is possible by certain special means to confine the knowledge to the Board of Directors of the Holding Company. Usually, however, the financial world is aware of the situation, though the man in the street may not be so.
>
> 'It is a question for the Directors of companies concerned in a combine to decide as to how far in regard to this matter of disclosure they should take the shareholders into their confidence. It must be remembered that it is, practically speaking, impossible to afford the information to shareholders without giving it also to competitors . . .'[54]

(*d*) *Some particular cases*

We can see, from a perusal of the dozen actual published accounts of British companies which Garnsey printed in the Appendix to the 1923 edition of his book, that some few boards of directors of holding companies at least, at the time of Garnsey's lecture, had already decided to adopt amalgamated statements in some form. Nobel Industries Ltd (see below) had presented a consolidated form of Balance Sheet at December 1920 – admittedly a year out of date – to the annual general meeting held in 1922 to consider its accounts for 1921. Within a year or so of Garnsey's lecture a few further companies were publishing consolidated balance sheets in some form. In December 1924, *The Accountant* was referring to the Tube Investments Ltd 'combined statement of assets and liabilities' then published for the first time as 'an excellent example to other holding companies'.[55]

The English Electric Co Ltd was also converted, though more slowly. Formed in 1918, to acquire controlling interests in The Phoenix Dynamo Manufacturing Co Ltd, Dick, Kerr & Co Ltd, the United Electric Car Co Ltd, the Coventry Ordnance Works and Willans and Robinson, the Company published with its accounts to December 1924, a statement that 'arrangements having been made to liquidate . . . (or) . . . to complete the liquidation of' the four companies first named above, the English Electric Board would present its accounts for the year 1925 'in the form of a consolidated balance sheet'. *The Economist* commented with satisfaction 'This is a practice which all interested in our policy for more light on company finance will welcome.'[56]

By contrast, many other companies showed no inclination to follow suit, despite encouragement – even pressure – from sources like *The Economist.* Thus, when the 1922/23 report and accounts of the P & O Steam Navigation Company were issued in December 1923, *The Economist* made a severe attack:

> 'As we have protested many times in the past, the presentation of a profit and loss account of this nature [showing merely a "net result" after providing an unstated amount for depreciation, etc.[is of little value, and entirely fails to give the shareholder a true idea of his company's position. It is such unfortunate examples as these which emphasize the urgency of reform in the matter of company accounts and the necessity of compulsory disclosure of more information to shareholders.
>
> 'The balance sheet . . . is still open to criticism for its lack of candour. It is true that a year ago, the absurdity of one single composite item on the [assets] side went by the board, and five separate items were substituted. Of these . . . however, two account for nearly £25 millions out of a total of £26 millions. . . It is time that directors of the large companies of the country began to set an example of greater frankness instead of publishing figures which obscure rather than reveal the position of affairs.'[57]

The Economist noted that the auditors' report did not follow the usual wording. However, the P & O was not a company registered under the Companies Acts.

The Annual Meeting of the P & O Company followed on 12 December, and the report of the Company Meeting appeared as usual in *The Economist's* advertisement columns. Lord Inchcape, the Chairman, was reported to have said:

> 'There were, doubtless, . . . some people outside that room who would like more information of the company's affairs than was given by the report and accounts and by his, the Chairman's, speech. To say much more might lead to their being urged to increase the dividend, and to a depletion of their resources, which would be a departure from the conservative policy which had guided the P & O Company throughout its existence. The precepts of Balzac still held the field in business. He would quote five of them:
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> "Don't beat the bush for others."
>
> "Trust no one farther than you can see him."
>
> "Never say what you do, but always do what you

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[53] *Op. cit.*, p. 171.

[54] *Op. cit.*, p. 175.

[55] *The Accountant*, 6 December 1924, p. 824.

[56] *The Economist*, 9 May, 1925, p. 909.

[57] *The Economist*, 8 December, 1923, p. 1009.

say."

"Keep your hands to yourself, and the same with your purse."

"Sell your jewels for more than they cost you."

The first four they could carry out, but at the present time there was a difficulty about the fifth..

'There was no greater fallacy than that shipowners had made money out of the war . . . They had to consider their great organisation and their staff, and to carry on until things improved . . .'[58]

After the 1947/48 Companies legislation, the special vulnerability of shipping companies to foreign competition, which might be subsidised or sub-standard in terms of safety or working conditions, was recognised in a special Board of Trade exemption in the matter of undisclosed (secret) reserves. But Lord Inchcape in 1923 gave no inkling that he was pleading a special case in what we might nowadays call his oblique and anti-intellectual response. Nevertheless, the report of the Company Meeting records that no questions were asked on the report and accounts, the adoption of which was carried unanimously, the dividends as recommended being approved, and the retiring directors re-elected.

The case of Lever Brothers Ltd deserves attention, because of its size and because its new chairman Mr F. D'Arcy Cooper (the first Lord Leverhulme having died in the same year) was to give important evidence in 1925 to the Committee on Company Law Amendment. The Soap industry, as well as the Oils, Fats and Margarine trades, had been investigated under the Profiteering Acts by Sub-Committees appointed to report to the Standing Committee on Trusts. The respective reports (Cmd 1126 of 1921 and Cmd 982 of 1920) had been published in the years indicated. Sir William Beveridge had chaired the Soap enquiry, whose report tells us that Lever Brothers was, at the beginning of the war, the centre and direction of a group of forty companies, which had increased to 140 by the end of 1920. Of these, 39 at that date, manufactured soap – in 18 Lever Brothers had 100 per cent of the voting power, in 13 they had 50 per cent or over, in two they had less than 50 per cent, and companies controlled by Lever Brothers had a pecuniary interest, generally a predominant one, in the remaining six.

The other Lever Brothers companies covered 'banking, shipping, engineering, mining, building, whaling, seed-crushing, oil-refining, plantations and fisheries, as well as the manufacture of dyes, chemicals, industrial gases, candles, margarine, disinfectants, polishes, perfumery and paper'. Some of the companies had been 'promoted by Lever Brothers, whilst in others they [had] acquired controlling interest by acquisition of shares'.[59]

Considering the harshness of its words on the P&O in December 1923, *The Economist* was mild in its reception of the Lever Brothers accounts for that year showing a 'balance of profit and loss account' of £5 million odd. It referred to the balance sheet 'where total assets are given as £67,915,593', commenting merely:

> 'Assets mainly consist of investments in associated companies, this item alone amounting to £54,016,556. A little more information here would be welcome.'[60]

Two years later, *The Economist* returned to form, thus:

> 'The annual report of an organisation which has grown into the largest British industrial enterprise is quite rightly a subject of very widespread interest. Hitherto, however, the reports of Messrs Lever Brothers have been distinguished by obscurity and the scantiness of the information which they have afforded to shareholders . . . The public may put up with this kind of thing when the direction is in the hands of a superman whose commercial ability they are prepared to back, but the principle is radically wrong, and we hope that the Report of the Committee on Company Law will contain recommendations which will discourage or end such obscurantist practices.'[61]

But by this time, Lord Leverhulme had been dead a year, and it was nine months since Mr D'Arcy Cooper had given his evidence to the Greene Committee. *The Economist* did not know it, but the Committee had already decided that no more than the minimum of change should be recommended.

The case of the United Dairies is interesting because of a recommendation made in one of the Interim Reports of the Linlithgow Committee[62] that 'the government should consider . . . introducing legislation to require holding companies which are in a position similar to that of the United Dairies to file with their annual return . . . a co-ordinated balance sheet showing *inter alia* how much of their capital is represented by: (a) goodwill and other intangible assets; (b) fixed assets; and (c) floating assets and also the aggregate amounts of their (d) liabilities; (e) reserves; and (f) profits'.[63]

Milk had already been the subject of an enquiry in 1920 under the Profiteering Acts, [64] and in the previous year also by the Astor Committee which was concerned with methods of distribution, hygiene and santitation.[65] The Linlithgow Committee (which included Sir Basil Mayhew, KBE FCA, a founder partner in Barton Mayhew and Co, chartered accountants) thought that the United Dairies controlled about 65 per cent of the total milk supply of Greater London, and noted that the Company

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[58] *The Economist*, 15 December 1923, p. 1068.

[59] Cmd 1126/1921, para 6.

[60] *The Economist*, 5 April 1924, p. 733.

[61] *The Economist*, 10 April 1926, p. 724.

[62] Interim Report on Milk and Milk Products of the Departmental Committee on Distribution and Prices of Agricultural Produce, 1923, Cmd 1854.

[63] *Op. cit.*, para 240.

> 'owns 45 creameries in England and Wales . . . a London wholesale milk business, numerous London retail milk businesses; five condensed and malted milk factories; a dairy utensils and machinery business; and a Smithfield provision business . . . The Company owns its own saw-mills, and also its own factories for the manufacture of condensed milk tins.'[66]

The Committee added:

> 'All these different businesses are worked through subsidiary companies, the United Dairies Ltd, operating purely as a holding company.'[67]

United Dairies Ltd had been formed in 1915, when three large dairy companies were finding it impossible to carry on in competition, with their horses being requisitioned, and many of their men joining the Services. The Linlithgow Committee noted the high standards of efficiency achieved by the United Dairies, and the improvements that company had introduced, but the Committee's object was to investigate the disparity (for agricultural, etc, products, including milk) between the prices being received by producers and those paid by consumers. For this, the profits earned by distributing concerns were relevant and in the UD case the Committee had been unable to estimate to their satisfaction either profits or capital invested. The United Dairies subsidiaries were private companies and although profit and loss accounts for subsidiary milk businesses for a six-month period were furnished to the Committee, balance sheets were not submitted for the Committee's information.[68]

It cannot be a significant coincidence that the Linlithgow Committee was appointed on 13 December 1922, the day after Garnsey's lecture. But their recommendation about legislation for 'co-ordinated' balance sheets for holding companies like the United Dairies was clear and forthright. Sir Basil Mayhew signed the Milk Report with Lord Linlithgow and the rest of the Committee on 17 April 1923. On 12 April 1923, Mr Francis D'Arcy Cooper (who had been a partner in Cooper Brothers and Co since 1910 – apart from a period of active service during the war when he was seriously wounded) was appointed a director of Lever Brothers Ltd, a post whose duties he had been effectively carrying out since 1921.[69] Cooper Bros were Lever Brothers' auditors, and had been connected with that company from its earliest days. Mr D'Arcy Cooper became Chairman of Lever Brothers on Lord Leverhulme's death, and, in 1925, was the only chairman of a large industrial group to give evidence to the Greene Committee. The Committee were to be closely guided by his opinions about the accounts of holding companies.

Before, however, we turn to the Report of the Greene Committee, and the evidence given to it, we must look at one more case, that of Brunner, Mond and Co Ltd, which is noteworthy because it provoked an exchange of correspondence in *The Times* during the period that the Greene Committee was taking evidence.

Brunner Mond, Nobel Industries, the British Dyestuffs Corporation, and the United Alkali Company were to be the four constituent companies which were to merge to become Imperial Chemical Industries Ltd in 1926. The directors of the British Dyestuffs Corporation had agreed in 1923 to the publication of their 1920/21 accounts in the Appendix to Garnsey's book: they showed a 'legal' balance sheet supplemented by a combined statement summarising the assets and liabilities of the Corporation's 'associated', (i.e. subsidiary) companies. British Dyestuffs auditors were Thomson McLintock. Nobel Industries had produced a consolidated balance sheet dated December 1920, at their annual general meeting in September 1922, when Nobel's chairman (Sir

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[64] Cmd 1102 of 1920.

[65] Cmd 483 of 1919.

[66] *Op. cit.*, para 93.

[67] ibid.

[68] *Op. cit.*, paras 98 and 106.

[69] Charles Wilson, *The History of Unilever:* Vol I, p. 269: Cassell, London, 1954. Mr D'Arcy Cooper became Vice-Chairman of Lever Brothers shortly after joining its Board and, in 1925, Chairman of that Company. He was created a baronet in 1941, the year of his death. See also *The Times* 19 December 1941.

[70] Sir Harry McGowan (Lord McGowan from 1937) was to become the second Chairman of ICI Ltd. Another director of Nobel Industries Ltd, and also at that time its Secretary, was Sir Josiah Stamp (Lord Stamp from 1938) and we may be sure that he had some part in the arrangements for the consolidated balance sheet. Stamp had left school at 16, and had a distinguished early career in the Inland Revenue. He obtained a DSc(Econ) degree of London by thesis in 1916 (when he was 36) and became a distinguished economist and statistician to whom honorary degrees were awarded by no less than twenty-three universities, beginning with Oxford, Cambridge, and Harvard. He was one of the first directors of ICI Ltd, and later president of the executive of the LMS Railway. Among many other activities Sir Josiah Stamp was an examiner to the Society of Incorporated Accountants and Auditors, of which body he was elected an honorary member. His eldest son became a chartered accountant. Speaking at the Annual Conference of the Incorporated Accountants in Liverpool in 1921, Sir Josiah said, *inter alia*,

'. . . deliberate upon the sorry figure that is cut . . . by . . .

Harry McGowan)[70] had explained it to his shareholders, introducing it as 'practically an innovation for large concerns so far as this country is concerned'. It appears from the report of the meeting[71] that Nobel's planned to put another consolidated statement to their next annual meeting, though they seem to have thought that the time taken to obtain and aggregate the information would necessarily require their next consolidated balance sheet to be once again a year out of date. Still, they were able to assure shareholders at the 1922 meeting that

> 'We know sufficient about the position which will be disclosed by this consolidated balance sheet at December 1921, to be able to state that it will prove no less satisfactory.'

Nobel's auditors (W. B. Peat and Co, and Thomson Mclintock) had been involved in the preparation of the consolidated balance sheet –

> 'This annual aggregated document is . . . approved by, and under the criticism and examination of, our auditors'.[72]

The directors of Brunner, Mond and Co, on the other hand, took a different view on consolidated statements, and at that company's annual meeting on 22 May 1925, its chairman, Mr Roscoe Brunner, said:

> '. . . a good many of the financial papers have lately been advocating that a holding company . . . should present to the shareholders what is called a consolidated balance sheet, and an eminent accountant has written a book on the subject. While we can defend as absolutely correct the figure we show in our balance sheet as the value of our investments – very largely in subsidiary companies – we do not think any consolidated balance sheet can present a true picture of our company's affairs, and I am fortified in that opinion by a letter received from an accountant, also of great eminence, Sir Arthur Whinney,[73] which I have his permission to read. He begins:
>
> "Allow me as a shareholder . . . to congratulate you on the very strong position shown by the balance sheet of the company, which is just to hand . . . Although the balance sheet is silent as to the investments in subsidiary companies, I hope your board will not be led into the prevailing error of issuing a balance sheet in which all the figures of parent and subsidiary companies are consolidated, which is necessarily wrong from the point of view of the creditors, and may be wrong as regards the shareholders. I should not have intruded my views were it not that there seems to be a general tendency amongst shareholders and others to call for consolidated balance sheets, to which there is, in my opinion, grave objection." '

Mr Roscoe Brunner continued:

> 'We will leave these eminent accountants to fight out the battle, but in our own case all our subsidiary companies, with the exception of Synthetic Ammonia Ltd, and our Eastern companies, publish their own accounts. Synthetic Ammonia . . . is in the process of being changed from a private company to a public company, and in future it will have to publish them . . . our Eastern companies are only merchanting companies . . . you will thus see that in our case a consolidated balance sheet is wholly unnecessary.'[74]

The Times Report did not name the auditors.

Gilbert Garnsey must have felt he could not let the Brunner comments pass, and he wrote to *The Times* on 25 May 1925, incorporating a copy of a letter he had written to Mr Brunner explaining that there really was 'no difference of opinion between Sir Arthur Whinney and myself' upon the question under discussion, and emphasising that nowhere in his book did he advocate the substitution of any form of consolidated balance sheet for the 'legal' balance sheet. Garnsey summarised, in his letter to Mr Brunner, his 'Methods' noting that Mr Brunner evidently thought what we have earlier called Garnsey's Method II (publication of the 'legal' balance sheet and the separate balance sheets of all the subsidiary companies) was the best for his company. However that might be, he concluded:

> '. . . the main point I desire to make clear [is] . . . that there is no difference of opinion between Sir Arthur Whinney and myself, or indeed, so far as I am aware, between accountants generally on the question you raised in your speech.'[75]

Sir Arthur Whinney responded in a letter published

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a 'safe' or 'sound' balance sheet, which lies in almost every line and yet is approved . . . because it overstates no assets and understates no liabilities . . . prudence is just as possible without departing from what a balance sheet ought to be – a faithful record of the employment of the total capital invested in the business . . .' (*Incorporated Accountants' Journal*, November 1921, p. 44).

Lord Stamp was a Governor (and became Chairman of the Governors) of the London School of Economics and Political Science. He was also, amongst other things, a Governor of The University College of Wales, Aberystwyth, with which town he and his wife had a lasting association. Both, with their eldest son, were tragically killed in an air raid in Kent in 1941. A reference to an address given by Sir Josiah Stamp in 1925 is made at the end of this article.

[71] *The Economist*, 23 September 1922, p. 516, and *The Times*, of the same date.

[72] *Ibid.*

[73] Sir Arthur Whinney was senior partner of Whinney, Smith and Whinney, and was to be President of the ICA/EW in 1926/27. He died in 1927, aged 62.

[74] *The Times*, 23 May, 1925.

[75] *The Times*, 29 May 1925.

in *The Times* of 3 June 1925. He noted that Sir Gilbert claimed that there was no difference of opinion between them, and hoped it was so. He then made the following points:

> '(1) The only balance sheet which a company is, by law, bound to issue is that . . . required . . . by the Companies Consolidation Act 1908, and by a company's articles of association. . . .
>
> (2) A balance sheet which incorporates the figures of other companies, even if subsidiary, is necessarily supplementary.
>
> (3) In so far as such balance sheet is a conglomeration of the assets and liabilities of separate companies, presented as being the assets and liabilities of one undivided entity, it is misleading to creditors and may be so to shareholders.
>
> (4) It is incorrect to describe such a statement as being the consolidated balance sheet of any one company.'[76]

Sir Arthur Whinney's letter carried the impression that he and Sir Gilbert were at odds, though Garnsey would certainly have agreed with him on points 1, 2 and 4, and gone with him on 3 at least as regards creditors. See above, especially footnote 25.

In the same column of *The Times* of 3 June 1925 was a letter from Mr F. D'Arcy Cooper, also referring to Sir Gilbert Garnsey's letter of 25 May. It will be convenient to reproduce the greater part of Mr Cooper's letter here, because he himself referred to it in his memorandum of evidence to the Greene Committee:

> 'While Sir Gilbert purports to speak for himself and Sir Arthur Whinney, I do not know on what grounds he bases his statement that there is no difference of opinion between accountants generally on the question of an amalgamated balance sheet. Accountants with whom I have discussed the matter see no object in the proposal, and I have never yet seen what useful purpose would be served by an amalgamated balance sheet. If directors considered that the publication of an amalgamated balance sheet was in the interests of their shareholders they would no doubt publish it, although the practical difficulty of delay would be a serious one.
>
> So far as the interests of creditors are concerned, it is a fallacy to suppose that they would be better informed; they would only be misled, because the creditors of one company have no claim upon the assets of another company.
>
> There remains public interest or curiosity, and even then the public would be more mystified than enlightened by a so-called amalgamated balance sheet. What, in fact, would it show to assist the public in gauging the strength or weakness . . . of a company?
>
> The value of the shares of a trading company is determined by its earning power, and not by the nature of its assets. . . . The earning capacity of bricks and mortar in itself is nothing; it is the goodwill of the business that creates earning capacity.
>
> I do not think it would be denied that it would be improper for a parent company to take to the credit of its profit and loss account the profits of its subsidiary companies without reserving for losses of subsidiary companies, but so long as this is done and the profit and loss account shows the total net profits or losses (as the case may be) of the whole of the companies, I see no useful purpose in producing an amalgamated balance sheet which would be neither fish, flesh, fowl nor good red herring. On the contrary, in my opinion, it could only do harm.'[77]

Mr D'Arcy Cooper wrote from his home address.

That there must have been differences of opinion among accountants about consolidated balance sheets is not to be doubted. But not a single significant reference to such differences is to be found, for example, in the columns of *The Accountant* between December 1922 and June 1925. Only in May 1925, *The Accountant* had greeted 'a consolidated balance sheet of all the companies comprised in the Spillers combination' as 'an innovation which is certainly a step in the right direction . . .'.[78] Nevertheless, in *The Times* of 9 May 1925, early rumblings of the dispute were to be noted. That newspaper had commented favourably, on 5 May,[79] on the English Electric Company's decision to present its 1925 accounts 'in the form of a consolidated balance sheet:'

> 'This is an improvement which . . . will give [shareholders] a more complete picture of the company's position. For large concerns of the amalgamated or associated class a consolidated balance sheet is in accordance with the best practice.'

On 9 May in the same column of its City Notes, *The Times* quoted an extract from a letter received from Sir Arthur Whinney, about their Note of 5 May, drawing attention to:

> '. . . a danger which arises from the merging into one balance sheet of the figures of companies which have a distinct legal entity . . . that creditors . . . [may wrongly] look to assets to which they may, in fact, have no legal rights. . . .'[80]

The Times City Notes commented:

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[76] *The Times*, 3 June 1925. Sir Arthur Whinney was elected Vice-President of the ICA/EW on the afternoon of the same day.

[77] *The Times*, 3 June 1925.

[78] *The Accountant*, 2 May 1925, p. 705

[79] *The Times*, 5 May 1925, p. 22.

[80] *The Times*, 9 May 1925, p. 19.

> 'Undoubtedly there is a risk of this kind, but it would be run only by people who did not inform themselves fully of the position of those to whom they gave credit.... The object, of course, of giving a consolidated balance sheet is merely to provide the shareholders of the parent company with valuable information which under the older form of balance sheet would be unobtainable.'[81]

On 5 June, *The Times* published a response to Mr D'Arcy Cooper's letter which had been printed in its issue of 3 June. This came in the form of a letter from Mr Robert Ashworth, ACA FSAA, a member of a comparatively small London firm of accountants and the recent author of a book on limited liability companies.[82] Mr Ashworth attacked Mr D'Arcy Cooper's criticisms as being 'not constructive, as they provide no remedy for the present appalling position in which the shareholders of holding companies find themselves'. Mr Ashworth recommended publication of the legal balance sheet together with, 'a statement in the form of a balance sheet showing the position of the subsidiaries as a whole . . .'. Mr Ashworth urged, in reference to Mr Cooper's letter, 'That no useful purpose can be served by drawing red herrings across the track'.

Mr Ashworth's voice was, however, the only one raised in *The Times* correspondence in support of Sir Gilbert Garnsey or in defence of the consolidated balance sheet. On 6 June, *The Times* published a letter from Mr P. D. Leake[83] in which he foresaw 'only one practical remedy', namely,

> '. . . to provide that . . . the holding company's balance sheet shall show the names and holdings in the subsidiary companies, and [that the holding company] shall issue with its balance sheet copies of the last balance sheets of those other companies. If these subsidiary companies are private companies, the fact that the controlling interest resides in a public holding company should, *ipso facto*, involve the obligation to publish the balance sheets of such private companies.'

Mr Leake concluded:

> 'Consolidated balance sheets are never satisfactory; they are neither fish, flesh nor fowl.'

This closed the correspondence.

The Accountant, in a leading article on 'The Accounts of Holding Companies' on 8 August 1925, referred to Mr Roscoe Brunner's speech of 22 May, and the subsequent letters of Sir Gilbert Garnsey, Sir Arthur Whinney, Mr P. D. Leake, Mr F. D'Arcy Cooper and Mr Robert Ashworth, commenting (in marked contrast to its earlier reactions):

> 'The use of [the] consolidated balance sheet is . . . open to a good many objections, and if one may judge from the opinions which have been expressed recently by many chartered accountants its acceptance in this country is improbable. . . .'[84]

The Accountant mentioned proposals involving publication separately of the balance sheets of all the subsidiary undertakings or a summary of the assets and liabilities of all the subsidiary companies taken together. *The Accountant* thought it 'very difficult to refute' a suggestion by Sir Arthur Whinney that

> 'the correct method of presenting investments in subsidiaries in a holding company's balance sheet is to value them on a basis which indicates the sum to which the parent company is entitled after prior claims have been made. The information . . . should be supplemented by the publication of the balance sheets of the subsidiary companies with that of the Holding Company.'[85]

The Accountant ended its article by referring to the Company Law Committee then sitting, and concluded:

> 'No doubt, when company legislation is next embarked upon, the subject will engage the attention of the legislature.'

No wonder that, a year later, the Greene Committee's Report noted 'a considerable divergence of views . . .' on consolidated balance sheets.[86] The curious thing is that it took so long to emerge.[87] As we look back, half a century later, we may consider equally remarkable the slightness of the intellectual argument adduced by the opponents of consolidation in support of their case. Yet it proved sufficient for success, at least in so far as the Greene Committee were dissuaded from recommending in favour of legislation on consolidated balance sheets. We may wonder why the professional press was not used as the venue for debate; and wonder, indeed, whether *The Times* was preferred for the very reason that letters to the Editor (necessarily short) did not permit the development of argument at length. Certainly, at this distance in time, it is hard to believe that Sir Arthur Whinney and Mr D'Arcy Cooper were convinced merely by the arguments they put forward in their letters. Yet we need not doubt that their opposition to consolidated accounts was honest and their views sincerely held. An explanation carrying more conviction (though still scarcely an impressive explanation) was to emerge in the course of Mr D'Arcy Cooper's examination by the Greene Committee.

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[81] *Ibid.*

[82] *The Times*, 5 June 1925, p. 5. Mr Ashworth's firm was Newman, Ogle, Ashworth & Co, and his book *Limited Liability Companies*, Pitman, 1925.

[83] *The Times*, 6 June 1925, p. 18.

[84] *The Accountant*, 8 August 1925, p. 202.

[85] *The Accountant*, 8 August 1925, p. 204. At this time, Lever Bros Ltd had more than 200 subsidiaries (Evidence to the Greene Committee (Day 21), Reply to Question 4998).

[86] Cmd 2657 para 7 (and see next section).

[87] Sir Gilbert Garnsey had, after all, dealt with the creditors issue quite specifically in his lecture in 1922 and his book in 1923: see footnote 25 above.

Report of the Company Law Amendment Committee, 1926 (The Greene Committee)[88]

The Greene Committee was set up early in 1925, and took evidence between March and October 1925 on 26 days. Its terms of reference called for a general review extending over the whole field of Company Law. *The Economist*, commenting on those appointed,[89] regretted that the Committee included no spokesman of labour and only one eminent representative of industry (Sir Edward Manville). It noted that accountancy and the law were represented of necessity, 'the latter apparently to excess'. The accountants were Mr William Cash (a former President of ICA/EW) and Sir James Martin, a former President of the incorporated accountants. A third accountant (with an additional lawyer) was added in March 1925: he was Sir William McLintock, the eminent Scots CA who headed the London firm of Thomson McLintock. Sir James Martin had been a member of the Wrenbury Committee. The Committee's Secretary had also served the Wrenbury Committee.

When the Greene Committee reported in July 1926, they indicated their general line of approach thus:

> 'The evidence satisfies us that the great majority of limited companies, both public and private, are honestly and conscientiously managed. Cases in which fraud or lesser forms of dishonesty or improper dealing occur are comparatively few, and the public interest which such cases naturally arouse tends to divert attention from the vast number of honestly conducted concerns and to create an exaggerated idea of the evils connected with limited companies and their activities. We are further satisfied that the abnormal conditions prevailing during and since the war have been largely responsible for some of the matters which have given rise to unfavourable public comment, and we are of opinion that the return to more normal conditions will tend to eliminate certain unsatisfactory features which have shown themselves in recent years.
>
> 'Impressed by these considerations we have refrained from recommending any important change which was not, in our view, quite clearly demanded and justified by the evidence before us. . . .'[90]

On the matter of greatest relevance to this paper, the Committee said:

> 'The position of holding companies with particular reference to the form of their accounts has been much discussed before us and the evidence discloses *a considerable divergence of views* on the subject among both commercial men and accountants. Complaints have undoubtedly been heard from shareholders in such companies that the information given to them is unintelligible without fuller details as to the position of the subsidiary and associated companies. Some witnesses take the view that the publication of a consolidated or combined balance sheet for the whole group of companies should be made compulsory. We do not agree with this. Many holding companies have adopted the practice already and we consider that the matter should be left to the shareholders to make such requirements as to the form of their company's accounts as they may think proper. It is often forgotten that it may be in the best interests of the shareholders themselves that the accounts should be in a certain form, and we consider that undue interference by the legislature in the internal affairs of companies is to be avoided, even if some risk of hardship in individual cases is involved.
>
> 'In view of the divergence of opinion on this and cognate matters we only find ourselves able to make recommendations of a quite limited character. . . .'[91]

Effectively, the Committee's recommendations were incorporated in the Companies legislation of 1928–29, which required aggregate amounts for shares in and sums due from or to subsidiaries to be shown separately in the holding company's balance sheet. The legislation also called for a statement to be annexed to the balance sheet of every holding company stating (without necessarily mentioning any amounts) how the aggregate profits or losses of subsidiary companies had been dealt with for the purposes of the accounts of the holding company, and in particular how far provision had been made for the losses of any subsidiary company, either in the accounts of that company or of the holding company, and how any losses of any subsidiary had been taken into account by the directors of the holding company in arriving at the profits of the holding company.[92]

As regards evidence to the Committee on the accounts of Holding Companies, the representative of the London Stock Exchange (Day 5) had no views. The Federation of British Industries (Day 19) sought no legislation, but thought that directors should do their duty and that auditors should not be negligent. The Association of British Chambers of Commerce

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[88] Cmd 2657 of 1926.

[89] 10 January 1925, p. 55.

[90] *Op. cit.*, paras 7 and 9.

[91] *Op. cit.*, para 71. My italics

[92] Companies Act, 1929, s. 126. The statement to be annexed to the balance sheet of the Holding Company was also required to give particulars of any qualification of any auditors' report on the balance sheet of a subsidiary.

(Day 22) were in favour of a requirement for consolidated balance sheets. Their evidence was presented by Mr H. Lakin-Smith, FCA, a Birmingham accountant who had been a member of the Council of the ICA/EW since 1923. The Council of Associated Stock Exchanges (Day 15) in their memorandum of evidence favoured a requirement for 'aggregate balance sheets which must disclose the total amount of goodwill,' and they suggested that private companies controlled by Holding Companies should be required to file accounts with the Companies Registrar. The Manchester Chamber of Commerce (Day 26) also suggested this innovation, and the National Association of Trade Protection Societies (Day 16) made the same recommendation in their memorandum.

The Scottish Chartered Accountants in their memorandum thought it desirable 'to make it obligatory on Holding Companies to publish separate statements for each subsidiary company or a summary of them . . .'. On secret reserves, they thought that 'legislation, however desirable, appears to be impracticable'. Two representatives attended, on Day 17, one of them being a former President of the Aberdeen Society, one of the three constituent societies which together were incorporated into the Institute of Chartered Accountants of Scotland in 1951. Unfortunately, their memorandum did not explain, and in examination the Scottish representatives did not succeed in making clear to the Committee just what the summary statements recommended would contain and how they would be put together. They thought a consolidated balance sheet certainly gave 'a good deal more information than the ordinary balance sheet'. It was 'certainly a great improvement' (Qu 3438). However, they wanted to go further, and said a Holding Company 'should publish profit and loss accounts for each subsidiary company, or a summary of them, showing the profit or loss for each subsidiary company (Qu 3440), as well as a balance sheet (Qu 3442). But the form of the summary statement did not take a clear shape.

The Incorporated Accountants (Day 24) made recommendations in their memorandum designed to avoid the undue grouping together of heterogeneous assets in published balance sheets. They suggested legislation to specify a number of general headings under which assets might 'as a reasonable statutory minimum' be conveniently classified 'in sufficient detail as to give reasonable information to shareholders'. They recognised consolidated balance sheets for holding companies as 'advantageous' ('where the holding company holds the whole of the capital of the subsidiaries') and they recognised pressure from investors to induce some holding companies to issue amalgamated balance sheets as 'salutary'; but they did not seek to make the issue of such balance sheets obligatory. They thought secret reserves 'a benefit, provided . . . they are not used for . . . deliberate manipulation . . .'.

The Council of the ICA/EW (Day 21) took a strong line in their memorandum[93] against further legislation on accounts. Under the general heading of form and content of accounts they said:

> 'It is not considered possible to prescribe any stereotyped form of balance sheet and profit and loss account which will be applicable to all companies.
>
> 'The conditions under which companies carry on their business are so numerous, the nature of the business so varied and the places at which the businesses are carried on so spread over the world that to attempt to prescribe either a statutory form of balance sheet or what a balance sheet must disclose or that there should be in addition a profit and loss account is considered likely to do more harm than good.
>
> 'Shareholders have the remedy to a large extent in their own hands. They can and do ask questions at the annual meetings. The business done by limited companies is, on the whole, transacted by directors and managers, who are honest, and if in some cases they disclose in the published accounts less than some people desire the absence of detail is in most cases wise and is generally supported by the shareholders. To give in a balance sheet such detailed information as would afford full protection to creditors might mean the giving of a mass of detail of material value to competitors. The means of protection are largely in the creditors' own hands. If they are not satisfied as to the financial position of the concern they need not give extended credit. Creditors can ascertain as much about the financial position of a company as they can about that of an individual. In many cases want of common business care by the creditor is the chief cause of his loss. It is impossible by legislation to protect fools from their own folly.'

As regards the accounts of holding companies and their subsidiaries, the memorandum continued:

> 'It is considered undesirable to prescribe by legislation any rule for dealing in the accounts of Holding Companies with their subsidiaries. The circumstances under which such holdings arise are so varied and the places where such businesses are carried on are in some cases so spread over the world that to lay down any hard and fast rule would do more harm than good.
>
> 'In the opinion of the Council the form of the balance sheet should as at present be left to the directors and shareholders. To prepare a consoli-

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[93] Cmd 2657: Appendix to minutes of evidence for Day 21.

> dated balance sheet would not show the true position of the company, so long as the subsidiaries are separate entities. If the accounts of subsidiary companies had by legislation to be made up to the same date as the parent company and incorporated in that company's published accounts, by the time the details were received by the parent company for incorporation, the accounts of the parent company would in some cases be ancient history.
>
> 'The question of whether or not what has been described as the legal balance sheet should be supplemented by other balance sheets is a matter entirely for the directors and shareholders.'

Under the heading of 'Secret Reserves', the memorandum stated, *inter alia:*

> 'Secret Reserves or Inner Reserves are in certain cases desirable and in many cases essential. . . .
>
> 'If businesses carried on by joint stock companies are to be as successful in the future as in the past, too much disclosure should not be insisted on and the greatest possible freedom should be allowed to those responsible.
>
> 'It is always open to the auditors to report to the shareholders any exceptional reserves which are made or written back or other special matters dealt with in the accounts if the directors do not disclose them on the face of the accounts or in their report to the shareholders.'

The ICA/EW evidence was presented by Mr Sidney Pears, FCA, a member of the Council of the ICA/EW and of its Parliamentary and Law Committee. Mr Pears was, in 1925, senior partner of Cooper Brothers & Co. He answered over 250 questions in examination: extracts from three on consolidated balance sheets are given below:

> Qu 4450: '. . . Is it becoming the practice now among holding companies to give more information than they used to in the past to their shareholders – do you know?'
>
> 'I have not noticed it. I think some are going to give more details. I have heard that.'
>
> Qu 4451: 'Do you think they should publish a consolidated balance sheet?'
>
> 'If a consolidated balance sheet means putting into the holding company's balance sheet all the assets of every company in which it has got shares, and all the liabilities, it seems to me that the balance sheet is entirely wrong.'
>
> Qu 4452: 'I was not meaning in substitution for the legal balance sheet; but in some cases they do it in addition to that. Is that a practice which is growing at all?'
>
> 'I have not had any experience of its growing.'

The Law Society's memorandum of evidence (Day 14) was in some respects so like the ICA/EW's that a second look is needed to see which is which. On the form and content of accounts, and in the matter of secret reserves, the two memoranda present such a remarkable identity of view that it extends even to the actual wording employed. Indeed, the similarity of language is so extraordinary that it is evident that the two memoranda could not have been produced independently.

The Law Society's memorandum (Cmd 2657: Appendix to minutes of evidence for Day 14) was dated 22 May 1925 – the date of the Brunner Mond meeting. The ICA/EW memorandum bears the date of 7 July 1925. But we cannot conclude from these dates that the Law Society's memorandum was drafted first, even though it is rather fuller in style, with certain points given greater precision. We have, in fact, no means of knowing, from the published material, which was the original draft, but it would be surprising indeed if, for the sections dealing with accounts, the Institute's draftsmen had not taken the initiative in the (apparently) joint enterprise. Accordingly, it may be significant that it is under the heading of accounts for holding companies and their subsidiaries that (in the matter of accounts) the two memoranda are least alike. The Law Society, in fact, gave a friendly welcome to consolidated balance sheets, though it did not seek to make them a statutory requirement.[94] It is not beyond the bounds of possibility that the Institute's draft, under this head, was changed after 22 May 1925.

Mr F. D'Arcy Cooper gave evidence to the Committee on Day 18 as chairman of Lever Brothers Ltd. In examination he made the point that Lever Brothers were probably the largest holding company in Britain, ranking Imperial Tobacco as the next largest.

Mr D'Arcy Cooper had written a letter to the Committee (dated 24 June 1925) in response to a request from Mr W. A. Greene – the Committee's Chairman

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[94] The actual words of the relevant paragraphs in the Law Society's memorandum were:

" 'In some cases it might be reasonable, though it would probably serve little or no useful purpose, that a Holding Companys' interest in subsidiaries should be separately indicated in its balance sheet, but often as where a trade is carried on in a foreign country through a subsidiary or where a subsidiary company is formed to develop some process or business which it is desirable to keep secret it may be in the best interests of the Holding Company and its shareholders to give as little information as possible.

'In some cases the company's own balance sheet may usefully be supplemented by a consolidated balance sheet; but it does not necessarily follow that the consolidated balance sheet will give a true financial and business picture. Whilst the Council [of the Law Society] are of opinion that a combined balance sheet should be given wherever practicable they are of the opinion that this should not be made obligatory, but that the decision in each case should be left in the hands of the Directors and shareholders.' "

– which asked him (apparently following the publication of his letter in *The Times* of 3 June) to deal with four points, namely:

> '(1) Present practice of holding companies with regard to accounts submitted to shareholders;
> (2) Advantages and disadvantages of the present system;
> (3) What are the objections to disclosing to shareholders of the holding company the full accounts of subsidiaries;
> (4) Whether it is possible without commercial injury to give to the shareholders of the Holding Company such a statement with regard to the position of subsidiaries as would enable them to see the real position. If so, what form might such statement take?'

Mr Cooper's letter of 24 June[95] set out to deal with these points together. Thus, he said, *inter alia,*

> '... I think there is no doubt that the great majority of holding companies in this country do not publish separate balance sheets of subsidiary companies, nor do they attempt to produce what has been referred to as an amalgamated or consolidated balance sheet...'

In his further remarks, Mr Cooper made it clear that he was referring mainly to groups involving private subsidiary companies. He continued:

> 'At the outset I must say that I am not sure that I really understand what is meant by an amalgamated or consolidated balance sheet. The incorporation, in a statement purporting to be the balance sheet of a holding company of the assets and liabilities of other legal entities, would not, in my opinion, be a true statement of the position of the holding company, nor would it be a true statement of the position of each of the subsidiary entities. It would be a conglomeration of figures, futile as an aid to any person desirous of understanding the true position, and, so far as it was taken literally, misleading...'

Mr Cooper then went on to stress in his letter that he did not favour proposals to require private companies, whether or not controlled, to disclose their accounts. Mr Cooper agreed that nothing should be permitted to facilitate a holding company making use of its interests in a subsidiary company to give a false or misleading impression of its own affairs, but 'it does not seem to me that it will ever be practicable to make dishonesty impossible by legislation'. He continued:

> 'I strongly support the present practice of holding companies which is to take to the credit of the profit and loss account either the dividends declared or the profits earned by subsidiary companies, whilst at the same time providing out of the holding company's profits for all losses made by subsidiary companies, and any legislation which may be necessary to enforce such a practice would, in my opinion, be sound and wise.
>
> 'I do not know of any case in which this practice is not followed, and, in my view, if losses of a subsidiary company were not [provided] for in the accounts of the parent company, it should be the auditors' duty to comment upon this in the auditors' report to the shareholders.'

It will be worthwhile to set out Mr Cooper's two final paragraphs:

> 'The real point is that the information published by a limited company in its balance sheet should be correct, and if the existing law for penalising the publication of incorrect information or the passing by auditors of incorrect accounts requires strengthening, then I think that any measure to this end should receive universal support; but I venture to say that there is no justification for suggesting that a limited company should be compelled to publish such information as other persons may think necessary to enable those other persons for themselves to determine whether the published information is in their opinion correct and reliable.
>
> 'In conclusion. I respectfully submit that any legislation intended to alter the existing practice of publication of figures relating to the business of a limited liability company might seriously affect the interest of the shareholders who have subscribed the capital of the company, not only on the basis of the existing law, but also on the Articles of Association of the company under which the rights of all parties interested in the company are defined and regulated, subject only as such parties may choose to vary them.'

Mr Cooper had made the point in his letter that his views particularly related to the case of a holding company which had a number of subsidiaries each operating in effect, to carry out the work of a particular branch of the business. In such a case, the publication of full accounts would enable competitors to see how profitably or otherwise each branch of the business was being run.

When Mr Cooper appeared before the Committee on 1 July 1925, his ideas emerged more clearly in response to questions, and his answers to a few of these are given below. His comments on the value to competitors of information made available through a consolidated balance sheet are particularly interesting, thus:

> Qu 3770: (Chairman, speaking of the consolidated balance sheet) 'I am assuming it is in addition to the ordinary legal balance sheet of the holding com-

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[95] Cmd 2657: Appendix to minutes of evidence for Day 14.

pany – one could not do away with that?'

'That is so.'

Qu 3771: 'Do you consider that a consolidated balance sheet is a thing which, if properly prepared, would really afford more information to the shareholders than they get at present?'

'No, not the slightest – not information of any value to them.'

Qu 3773: 'Are they [consolidated balance sheets] open to any objection from the business point of view as affording information to competitors?'

'No.'

Qu 3774: 'You do not think they would hurt the company or its subsidiaries, from the business point of view?'

'No. I do not think they would. But it is disclosing information which I do not think would be of any value. I do not think it would hurt the company. Take the case of a newspaper company. If you had to take all the associated companies of a newspaper, you would have an item for plant and machinery and some stupendous item for goodwill; of course the main asset of a newspaper is goodwill. But the investing public have a prejudice – I do not know why – against the item "goodwill"; and I think the result would be that it would have a detrimental effect on those shares and that would be harmful to the shareholders of the company. After all, the people interested are the shareholders, and anything you do which would hurt them would be detrimental to their interests; but it would not affect the trade a bit.'

Qu 3776: (The Chairman had referred to criticism from shareholders of holding companies) – e.g. – 'They are not getting all the information that might be of interest to them.'

'I think I would agree to that. But I think they are getting all the information that is sufficient for them to form a correct opinion as to the value of their shares. I do not see where you will stop, in publishing information, once you start. You can give them more and more information if you like; you can split up the items *ad infinitum* in the balance sheet; but I do not think they would be any further forward. Would it be of any interest to them to know how the items are split up amongst plant and machinery, debtors and so on? I doubt if they would be better informed...'

Qu 3777: (The Chairman) '... one of the things they want to know is the way in which the subsidiaries stand and which branch of the business is profitable and which not?'

'I think they are not entitled to know that.'

Qu 3778: 'You think that is a matter they must take on trust?'

'I am absolutely in agreement that all losses or profits of an associated company should be taken into the balance sheet of the parent company so that they should know that their position in the associated company is maintained. That is right; and it is the common practice of companies within my experience.'

On the evidence before them, there can be little doubt that the Greene Committee were justified in finding as they did, despite the accusations of complacency which have been levelled at them over the years.

Consolidated accounts: a long apprenticeship for a tried technique

We have now taken the events relative to the accounts of holding companies which followed the Garnsey lecture of 1922 as far as space will permit. The fifty years which have elapsed since 1922 divide rather neatly into two quarter-centuries, the first running to 1947 when requirements for group accounts were incorporated in British companies legislation. Similarly, the years 1922–47 divide almost exactly into two halves, with 1934 as the mid-point year when a real step forward in the standard of published group accounts (indeed of published accounts generally) was taken with the publication of the Dunlop accounts for the year 1933.[96]

By comparison, the distance in time (from 1922 to 1926) covered by the present review seems short. But the Greene Committee's Report and the legislation of 1928–29 to which it led did not encourage innovation. The 1930s had begun before the accounts sections of the 1929 Companies Act were fully effective. In mid-1931 there was the Kylsant case, which started everybody thinking afresh. Still, changes after Kylsant were not immediate, and the positions taken up in the years 1922–26 were not generally vacated until 1934 or later.

We have quoted Sir Arthur Lowes Dickinson to the effect that from 1909 or thereabouts it had become almost universal practice in America for holding company groups to publish consolidated statements of earnings and consolidated balance sheets. In 1909 and for a few years thereafter there would have been very few such groups in Britain. But we have seen that their numbers were growing rapidly from 1915, if not earlier. Why did it take so long for the publication of consolidated group statements to become established practice in Britain? The technique was available, publicly so, from 1922. In particular, why, after an initial measure of acceptance did it encounter so much opposition in 1925?

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[96] Mr F. R. M. de Paula was Dunlop's Controller of Finance at this time. From 1926 to 1929 de Paula had held the part-time Cassell Chair of Accounting and Business Organisation at the London School of Economics. From 1942 he was a member of the ICA/EW's Taxation and Financial Relations Committee (now the Technical Advisory Committee) and from 1943 a member of the Council.

There had, of course, been a war – the most terrible in this country's history – from 1914 to 1918. Large numbers of qualified accountants and articled clerks had been away on active service. Many did not come back. Large numbers more worked in those years as civilians for one or other of the Services or Ministerial departments. For those who remained in the profession, there was a heavy additional load of war-time taxation. There was little time to try new techniques. After the war came a feverish short-lived boom, followed by a disastrous slump; a slow, dragging recovery; embittered relations between labour and capital in industry; high unemployment; eventually a government determination, clearly emerging, to go back to gold at the old parity – a decision which would demand that prices should again fall.

Factors combined to make things worse. More immediately, the 1919–20 boom, based on post-war re-stocking, had been supplemented by a burst of capital investment, hastily conceived, ill-directed, and in the event largely unremunerative. Insolvencies were high. In the longer term, major adjustments would have to take place as Britain's old staple industries began their long decline. Yet in some of these same industries the post-war boom had stimulated activity and falsely encouraged ideas of expansion.[97] In 1922, and after, the problem still remained of finding new employment for war-time factories and equipment. There was much to daunt Britain's industrialists, and though many recent fortunes had been made, many had been lost, and there was fear of dark days ahead.

For the rest of the nation, the appalling war-time casualty lists had thrown into relief the condition of those who had stayed at home and done well out of the war. There were some. Suspicion of combinations and profiteering had been fostered. The Committees on Trusts and the endless enquiries under the Profiteering Acts had followed. Despite the dismantling of war-time controls, many industrialists were haunted by what, in our eyes (as we look back over a half-century) were clearly spectres of renewed state interference, but then seemed more substantial. The Interim Report of the Linlithgow Committee on Milk distribution costs, concerned in 1923 about the lack of information on the United Dairies profits, saw fit to threaten.

> '. . . the company [United Dairies] may, in its own interests, desire to increase public confidence by supplying information . . .
>
> 'We do not consider that the situation warrants any such expedients as the nationalisation or municipalisation of supplies, or the formation of Public Utility Undertakings . We are, however, impressed by the fact that the formation of companies intended mainly to hold the securities of and receive dividends from merged companies results in considerable obscurity as to the precise financial position of the associated undertakings.'[98]

The Committee was making its case for legislative powers to compel information – see above. When these were not forthcoming, the effect of the threat was to encourage secrecy.[99] On top of all this, there was a Labour Government for the first time in 1924.

Many business men, particularly industrialists and directors of large undertakings, felt themselves hard-pressed and on the defensive, surrounded by more or less hostile faces, whether of creditors, competitors, shareholders, labour, government, or the public. To many of them, to increase disclosure seemed tantamount to inviting more criticism – at the least more questions, and many had had their fill of inquiries.

For its part, the accountancy profession was aware that the form of a company's accounts is a matter for the directors. Auditors have the power to qualify their reports, but this, by itself, does not provide a ready means for introducing innovations. In any case, important sections of the profession remained unconvinced that consolidated accounts would provide additional information of benefit to shareholders. Whether profits were high or low, secret reserves were accepted policy – 'desirable' or even 'essential'; holding company structures offered special facilities for them. Consolidated accounts might disclose more than was desired. When the setting up of the Greene Committee brought the need for a decision, they saw not enough need for change. And the Stock Exchange showed no particular interest. Even shareholders, in Garnsey's words, were not 'insistent'. There were legalistic arguments against consolidation. The generality of accountants were unwilling to 'disregard the technical legal situation and to submit the substantial position' (again to use Garnsey's words from his 1922 lecture, p. 61) by treating the holding company as owner of all the group assets and responsible for all the group liabilities and the interests of the minority shareholders, remembering that the legal balance sheet would also be available.

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[97] *Britain and the World Economy*, 1919–70, L. J. Williams, London, 1971, p. 18.

[98] Cmd 1854 paras.

[99] There were other examples. A Royal Commission on Food Prices was set up in 1924 and reported in April 1925 (Cmd 2390). Its Chairman was Sir Auckland Geddes. *The Accountant* noted (16 May 1925, p. 783) '. . . (the) Commsision is not in favour of state trading, but it does advocate a form of state control through the establishment of a Food Council . . .'

Perhaps we can best conclude by recalling the closing words of an address by Sir Josiah Stamp, given in October 1925 to the London Members of the ICA/EW. Sir Gilbert Garnsey was in the chair, and the title of the address was 'Accountants' Problems of Today: and outsider's reflections'. Sir Josiah said:

> 'Think sometimes of the balance sheet from the realistic point of view and not the legalistic, and a flood of light will come upon you. The consolidated balance sheet is familiar enough in America, but is only beginning to be known in this country. It can be developed with appropriate public education to understand it, and it is at any rate better then giving a sheaf of subsidiary accounts without nexus which bewilder the average shareholder...
>
> 'It seems to me that there can be nothing to be said against the publication of consolidated balance sheets in conjunction with the legal balance sheet, and everything to be said for it. Only in time will its full significance be appreciated. I am not pleading for wholesale legal action. It will grow by the establishment of the best as a practice, and the best is not necessarily what is oldest until it is shaken up by some abuse in a law court...'[100]

Prophetic words.

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[100] *The Accountant*, 31 October 1925, p. 687.

Budgetary Control and Business Behaviour

Adrian Buckley and Eugene McKenna

Nowadays most companies of any size employ some of the techniques of management accounting. Probably the most widely used is budgetary control.

The process of budgeting consists of planning, controlling, co-ordinating and motivating through money values, members, and departments within an organisation. In a nutshell, the budget is a plan – usually for one year ahead – in quantitative terms. The control follows by means of comparing actual performance against the performance standard and taking corrective action where necessary. The key features of budgetary control are as follows:

> the system is a yardstick for comparison. The planned performance is meant to be perceived by management as a target that should motivate managers towards achievement of the goal implied by the budget.
>
> the system transfers information in quantitative terms.
>
> it isolates problems by focusing upon variances.
>
> The identification of variances makes the system an early warning for management action.
>
> it should identify and highlight performance items as opposed to non-performance items (non-performance items include cause and effect outside the control of the company, e.g. a strike in a tyre supplier will affect Ford sales, but Ford cannot be said to be to blame).
>
> it is a tool of management, not a policing mechanism.
>
> it should be a formalised system culminating in management action.

The sinews of the budgeting process – and indeed of most other management control systems – are the influencing of management behaviour by setting agreed performance standards, the evaluation of results and feedback to management in anticipation of corrective action where necessary.

Since most management controls are conceived and operated by accountants, it is relevant to question whether accountants in general are aware of the impact upon people of these control systems. For there is a body of research findings which is highly critical of accounting control procedures. But, at least in this country, the accounting literature appears only to have given marginal coverage[1] to this most important topic and the syllabuses and examination questions of all the bodies of accountants make little reference to behavioural science. This may be because, as Tricker[2] points out 'the accountant is sometimes suspicious of the emphasis in management studies on people. People are difficult to quantify', but 'the understanding of management planning and control systems hinges on an understanding of people. Organisational theory has a place in the accountant's background knowledge.' However, the Association of Certified Accountants has recently announced a proposed new examination syllabus which includes a paper on Human Relations.

Control and company objectives

Most management control systems are assumed to operate as part of a series of devices designed to enable the company to achieve its corporate objective. Budgetary control is in addition a monitor of actual outturns in the light of short-term estimates of performance. But given that management controls aim to help the achievement of the corporate objective, it is pertinent to ask what most meaningfully constitutes a corporate objective.

When accountants examine this problem they invariably think in terms of maximising profit. A study by Caplan[3] showed that 75 per cent of accountants viewed this as the key business objective, whilst of a sample of non-accounting general managers only 25 per cent saw this as the primary business objective.

The traditional economic theory of the firm explains the behaviour of 'economic man' in pursuit of maximum profit. The theory views the entrepreneur as confronted with:

a demand function, in which the prices of the commodities he sells are given by the market

a cost function, in which the prices of the factors of production which he purchases are given by the market

a production function, which is essentially a statement of engineering technology.

In this situation the entrepreneur's behaviour is assumed to be predicted by his desire to maximise economic profits. This theory of business behaviour is based on the following set of assumptions:

complete knowledge of alternative courses of action

unlimited cognitive capacity

perfect knowledge of outcomes

total rationality in decision choice.

The modern theory of financial management takes a view near to economic theory in suggesting that: 'the operating objective for financial management is to maximise wealth or net present value'[4] of the owners.

But neither of these views is endorsed by research findings in this area, and it is doubtful whether the concept of profit maximisation is relevant to any but the most entrepreneurial of businesses.

Indeed most economists would view the economic theory of the firm as an abstraction which hardly simulates today's business world. Ideas of rationality and perfect knowledge are inconsistent with the realities of uncertainty and limited reasoning. There is also substantial opinion which questions the profit maximising desire of the firm. Some writers, having observed the development of the modern corporate entity, and the divorce of ownership and control, assert that managers, with minimal equity stakes in the company, are less motivated than the owner-manager.[5] Others[6] have suggested that economic survival may be the primary goal of a business. Alternatively, some firms[7] may appear to maximise sales provided that a satisfactory return on invested capital is earned.

This approach is well in line with the concept of 'satisficing' developed by Herbert Simon[8] from his observations of the workings of administrative systems. Instead of economic man, Simon talks of 'administrative man'. Whilst economic man maximises – selecting the best course of action available – administrative man satisfies – that is, he selects a course of action which is satisfactory or good enough. In business terms, administrative man seeks adequate profit rather than maximum profit; a fair price rather than maximum price.

Another concept of the role of the company sets out somewhat ideological goals, i.e. conducting[9] 'the affairs of the corporation in such a way as to maintain an equitable and working balance amongst the claims of the various directly interested groups – stockholders, employees, customers and the public at large'. How this compromise is achieved may vary from one firm to another, but the existence of a balance presupposes a conflict with profit maximisation which is solely a shareholder objective.

The interpretation of the firm's goals as the various interacting motives of the interested parties is endorsed by the research of Cyert and March,[10] who argue: 'that the goals of a business firm are a series of more or less independent constraints imposed on the organisation through a process of bargaining among potential coalition members and elaborated over time in response to short-run pressures. Goals arise in such a form because the firm is, in fact, a coalition of participants with disparate demands, changing foci of attention, and limited ability to attend to all organisational problems simultaneously.' 'In the long run, studies of the goals of a business firm must reflect the adaptation of goals to changes in the coalition structure.' This concept, the behavioural theory of the firm, implies that it is meaningless to talk of a single organisational goal. It is the participants who have personal objectives, and organisational goals can only mean the goals of the dominant members of the coalition.

A similar picture has been suggested in the theory of managerial capitalism:[11] 'top management, owning little or no equity in the firm, has three main motives: growth, because growth provides job satisfaction, job expansion, higher salaries, higher bonuses and prestige; continuity of employment, which means for the management team as a whole, avoidance of involuntary takeover; and reasonable treatment of shareholders and generally good relations with the financial world.'[12]

Samuel Richardson Reid[13] has suggested that the concern of management for such factors as security, power, esteem, income and advancement within the firm may result in emphasis on growth of size rather than profit maximisation.

In summary, economic theory views the firm as an entrepreneur rather than as an organisation, and, assuming perfect knowledge of all market conditions, stresses profit maximisation. The behavioural theory, based on observations of how modern complex business enterprises function, sees a series of goals – the goals of the key individual members of the managerial coalition – as motivating decision making. As pointed out by Caplan,[14] 'most attempts to explain, predict, or motivate human behaviour on the basis of economic factors alone are likely to be notably unsuccessful'.

The roots of management control

The underlying rationale of most business control procedures is traceable to authoritative styles of management, although this leadership pattern is gradually being superseded by a more enlightened, democratic form which is inversely opposite to its nineteenth century forerunner. But it is questionable as to whether, in general, control procedures are changing in sympathy with more participative styles of management.

In this area Rensis Likert[15] distinguishes four styles of management. System 1, the exploitive authoritative type uses fears and threats, communication is downwards, superiors and subordinates are psychologically distant and almost all decisions are taken at the apex of the organisational pyramid. System 2, the benevolent authoritative style is where management uses rewards to encourage performance, upward communication flow is limited to what the boss wants to hear, subservience to superiors is widespread and, whilst most decisions are taken at the top, some delegation of decision-making exists. System 3, the consultative type, is where management uses rewards, communication may be two-way although upward communication is cautious and limited, by and large, to what the boss wants to hear, some involvement is sought from employees and subordinates have a moderate amount of influence in some decisions – but again broad policy decisions are the preserve of top management only. System 4, the participative style, gives economic rewards and makes full use of group participation and involvement in fixing high performance goals and improving working methods. Communication flows downward, upward, with peers and is accurate; subordinates and superiors are psychologically close and decision-making is widely done throughout the firm by group processes. Various personnel in the organisation chart overlap – they are members of more than one group – and thereby link members in the firm. The system 4 style of leadership is said to produce greater involvement for individuals, better labour/management relations and higher productivity.*

System 4 managers exercise 'general rather than detailed supervision, and are more concerned with targets than methods. They allow maximum participation in decision-making. If higher performance is to be obtained, a supervisor must not only be employee-centred' (as opposed to job-centred) 'but must also have high performance goals and be capable of exercising the decision-making processes to achieve them'.[16]

Closely associated to Likert's concepts is Douglas McGregor's postulation of Theory X and Theory Y behaviour within organisations. Theory X behaviour, as observed in the traditional concept of administration suggests that:[17]

> 'the average human being has an inherent dislike of work and will avoid it if he can'.
>
> 'because of this human characteristic of dislike of work, most people must be coerced, controlled, directed, threatened with punishment to get them to put forth adequate effort toward the achievement of organisational objectives'.
>
> 'the average human being prefers to be directed, wishes to avoid responsibility, has relatively little ambition, wants security above all'.

Because this philosophy of management behaviour became less prevalent in organisations which were moving towards industrial democracy, McGregor proposed alternative explanations for human behaviour in business – namely Theory Y. The assumptions behind Theory Y behaviour are:[18]

> 'the expenditure of physical and mental effort in work is as natural as play or rest'.
>
> 'man will exercise self-direction and self-control in the service of objectives to which he is committed'.
>
> 'the average human being learns, under proper conditions, not only to accept but to seek responsibility'.

The corollaries of Theory Y are important. They are that many more people in the firm are able to contribute constructively towards the solution of problems; second, that the main reward in the work situation is the satisfaction of the individual's self-actualisation needs (see also our reference to Maslow, below); third, the potential of the average person in the organisation is not being fully tapped.

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* But whilst this may generally be true, Fiedler's findings (Fred E. Fiedler, *A Theory of Leadership Effectiveness*, McGraw-Hill, 1967) suggest that styles of leadership other than system 4 can be perfectly effective. According to Fiedler in any situation cognisance must be taken of the extent of job structuring, power vested in the leader, and the relationship between leader and group member.

McGregor makes the point that whilst staff departments exist essentially to control the line (as is postulated by Theory X), conflict will exist between staff and line management. This conflict may be eliminated if the role of the staff specialist is perceived as being that of providing professional aid to all levels of management, i.e. a supportive relationship.

It should be noted that an investigation undertaken by Caplan[19] indicated that there were definite indications of cost accounting systems being based on the assumptions of the authoritative and Theory X models of behaviour. Thus, whilst management leadership styles have been evolving from System 1 through towards System 4, the management accounting system has not moved with the rest of the organisation.

For budgetary control purposes, Likert's findings suggest that the more participative the process of setting budgets, the more effective they are likely to be in terms of committing personal motivation towards their achievement. This view was confirmed by Coch and French[20] in a study of the effectiveness of participative versus non-participative budgets. Similarly Hofstede[21] tested the hypothesis that higher participation leads to higher budget motivation and found a positive correlation between these factors. In support of this, Bass and Leavitt[22] found that employees participating in setting standards performed better than those who did not.

But beware budget biasing and pseudo-participation. In connection with budget biasing – which is discussed in some depth later – managers may inflate costs or reduce revenue at the budget stage, thus making the budget standard more readily achievable; this is clearly easier to do in a participatory system. However, the problems inherent in this situation may be reduced[23] by an in-depth review during the process of developing the budget. In connection with pseudo-participation there can be no better example than the following, quoted from research findings by Chris Argyris.[24] 'The typical controller's insistence on others' participation sounded good to us when we first heard it in our interviews. But after a few minutes of discussion, it began to look as if the word "participation" had a rather strange meaning for the controller. One thing in particular happened in every interview which led us to believe that we were not thinking of the same thing. After the controller had told us that he insisted on participation he would then continue by describing his difficulty in getting the supervisors to speak freely. For example:

> "We bring them in, we tell them that we want their frank opinion, but most of them just sit there and nod their heads. We know they're not coming out with exactly how they feel. I guess budgets scare them; some of them don't have too much education. . . . Then we request the line supervisor to sign the new budget, so he can't tell us he didn't accept it. We've found a signature helps an awful lot. If anything goes wrong, they can't come to us, as they often do, and complain. We just show them their signature and remind them they were shown exactly what the budget was made up of. . . .'

'Such statements seem to indicate that only "pseudo-participation" is desired by the controller. True participation means that the people can be spontaneous and free in their discussion. Participation, in the real sense of the word, also involves a group decision which leads the group to accept or reject something new. Of course, organisations need to have their supervisors accept the new goals, not reject them; however if the supervisors do not really accept the new changes but only say they do, then trouble is inevitable. Such half-hearted acceptance makes it necessary for the person who initiated the budget or induced the change, not only to request signatures of the "acceptors" so that they cannot later on deny they "accepted", but to be always on the lookout and apply pressure constantly upon the "acceptors" (through informal talks, meetings and, "educational discussions of accounting").'

Budget motivation

The accountant generally perceives the budget as being a commitment, in quantitative terms, of future performance. As Robert Anthony[25] says 'by agreeing to the budget estimates, the supervisor in effect says to management: "I can and will operate my department in accordance with the plan described in the budget".' Hofstede[26] summarises this position by saying that 'budgets and cost standards act as incentives for motivating the budgetees'. However, this view is not necessarily universally accepted by authorities. Gordon Shillinglaw[27] says 'what is not commonly understood is that the budget itself is not intended to act as a motivating force'. But there is evidence that the budget can be a motivator. Is this generally true? Does motivation vary from tight budgets to loose budgets? What happens if the agreed budget becomes patently unachievable?

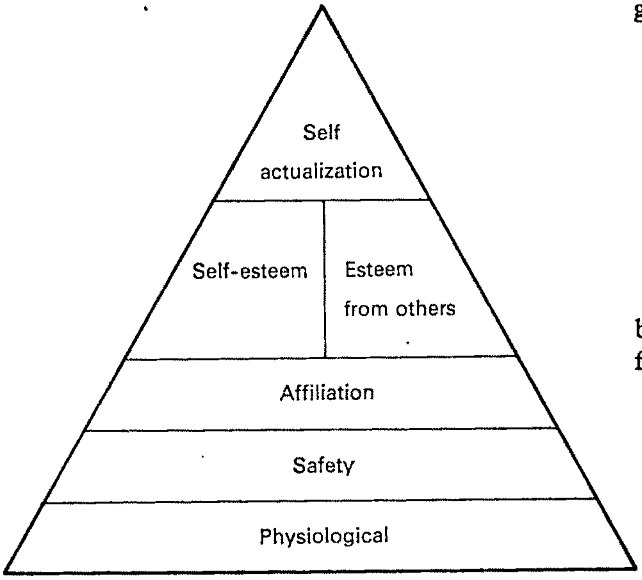
In examining the question of whether the budget is a stimulus or not, it is first necessary to look at some of the general concepts of motivation in business. For, as Hofstede[28] observes, 'there is no reason to assume that the basic needs of the budgeted manager will be any different from the basic needs of other people'.

The theories of three of the leading writers – Maslow, Herzberg and McClelland – on the subject are therefore summarised.

Maslow, Herzberg and McClelland

Maslow[29] conceives of the individual as striving to satisfy a hierarchy of basic needs represented in the pyramid in Exhibit I below.

Exhibit I Maslow's Hierarchy of basic needs



The foot of the pyramid represents the most basic need and the individual strives to move upwards through the hierarchy towards the apex of self-actualisation. Maslow observes[30] that 'man is a wanting animal and rarely reaches a state of complete satisfaction except for a short time. As one desire is satisfied, another pops up to take its place'. Thus only if the lower needs are satisfied will the higher needs appear. Physiological needs include food and rest. Safety needs include job security, a modestly comfortable and predictable routine and a desire for fair treatment and justice from supervisors in the job situation. Frustration of the safety needs lies at the root of resistance to change. Higher than safety needs come affiliation needs – social contacts, belonging to a group, love, etc. Maslow's next level is esteem, divided between self-esteem – the desire for achievement, competence, autonomy, strength, adequacy, mastery – and esteem from others – appreciation of performance, status, recognition. Desire for power also probably belongs in the esteem category. Self-actualisation, at the apex of Maslow's pyramid, implies fulfilling one's ultimate desires, or doing what one is truly fitted for.

Maslow's concept has been tested empirically* and is widely accepted, for example by McGregor,[31] and in terms of explaining actions seems intuitively appealing. How it affects budget motivation is discussed below.

The second motivational theorist looked at here is Fred Herzberg.[32] His concept is empirically based – although there are dissentient views[33] to his total concept – and is built on the principle that people are motivated towards what makes them feel good and away from what makes them feel bad. Herzberg's research identifies the following factors as producing good feelings in the work situation:

achievement

recognition

the work itself

responsibility

advancement.

All of these are real motivators. By contrast Herzberg suggests that the following factors arouse bad feelings in the work situation:

company policy and administration

supervision

salary

inter-personal relations

working conditions.

These latter factors are clearly concerned with the work environment rather than the work itself. Herzberg calls these 'hygiene factors', and they differ significantly from motivators inasmuch as they 'can only prevent illness, but not bring about good health'. In other words, lack of adequate 'job hygiene' will cause dissatisfaction, but its presence will not, of itself, cause satisfaction; it is the motivators that do this. The absence of the motivators will not cause dissatisfaction, assuming the job hygiene factors are adequate, but there will be no positive motivation. Herzberg's findings are summarised in Exhibit II below.

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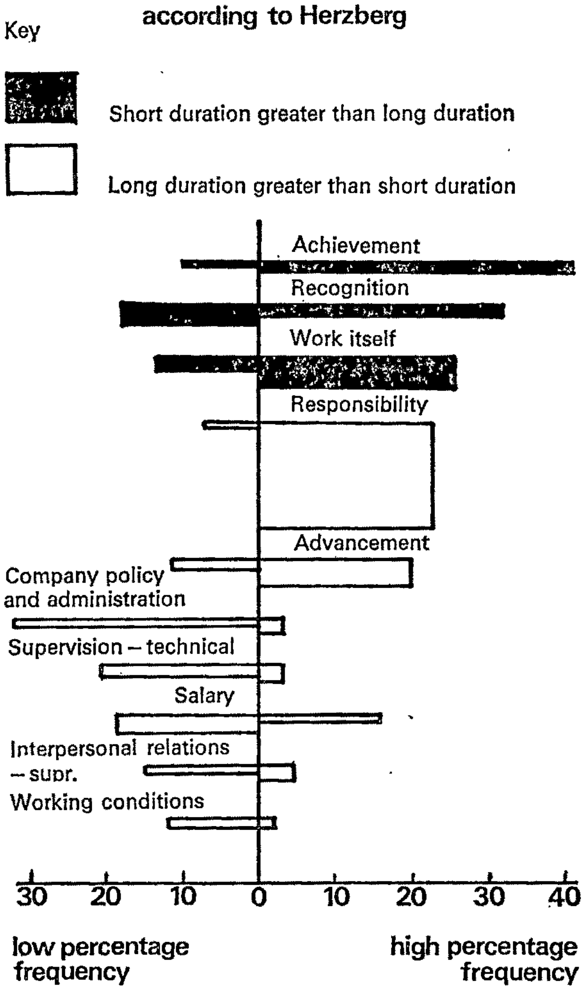
* For example D. T. Hall and K. E. Nougaim, 'An Examination of Maslow's Need Hierarchy in an Organisational Setting', *Organisational Behaviour and Human Performance*, 1968, No. 3, find support for the hierarchy in a field study based on the success of management trainees over a five-year period in the American Telephone and Telegraph Co. R. Pellegrin and C. Coates, 'Executives and Supervisors: contrasting definitions of career success', *Administrative Science Quarterly*, 1957, No. 1, observe that whilst executives tend to see success as career accomplishment, first line supervisors viewed success in terms of security and income. Similarly, L. Porter, 'Job attitudes in Management', *Journal of Applied Psychology*, 1963, No. 4, found that top executives are more concerned with esteem and self actualisation than managers occupying lower levels in the organisation.

Exhibit II Satisfiers and Dissatisfiers according to Herzberg



(See Reference 34.)

As Herzberg[35] explains, referring to the above diagrams, 'the length of each box represents the frequency with which the factor appeared in the events presented. The width of the box indicates the period in which the good or bad job attitude lasted, in terms of a classification of short duration and long duration. A short duration of attitude change did not last longer than two weeks, while a long duration of attitude change may have lasted for years.' It will be noted that the length of the salary bar is such that it is both satisfier and dissatisfier. In fact, in the Herzberg experiment it was the most ambiguous of all of the factors highlighted although the negative element tended to predominate.

It is axiomatic in Herzberg's approach that job satisfaction and job dissatisfaction are not opposites. The opposite of job satisfaction is not job dissatisfaction but no job satisfaction; the opposite of job dissatisfaction is lack of job dissatisfaction. The essence of Herzberg's message to business is that employee motivation is a function of challenging work in which responsibility can be assumed. Towards this end he prescribes various methods of 'job enrichment'.

As Hofstede[36] says, in setting Herzberg's motivation, i.e. hygiene factors in the context of Maslow's hierarchy of basic needs 'although some of the hygiene factors, like salary, may be related to several basic needs (e.g. safety, affiliation, and esteem needs), the general tendency of the above list is that the motivators are related to needs considerably higher in the pyramid ... than the hygiene factors'. Hofstede goes on to point out that 'in Western countries physiological needs are almost universally satisfied; safety needs to a greater extent; on the other hand, the standard for satisfaction of, for example, achievement needs will be much higher in the case of some occupational groups, for example scientists, than for others, for example assembly line workers.' We attempt below to put the Herzberg approach into the framework of budget motivation.

The third major contributor to motivation theory considered here is D. C. McClelland.[37] He suggests that two major needs can be discerned; these are:

- the need for achievement, which should be thought of as achievement identifiable with one's own efforts. In complex working organisations this is often very difficult.
- the need for power, which is not just limited to power over others, but includes also power over one's own liberty of action. Again, in work organisations, a person's liberty of action obviously has to be constrained. Whilst constraints are necessary in the organisation, unnecessary ones convert motivation to frustration.

Building in Maslow's hierarchy implies that achievement and power become dominant drives when the physiological needs are satisfied.

In developing his concept of the 'achievement motive', McClelland focuses upon the drive of people to be challenged and to be innovative and he found that the drive for achievement varies in individuals according to their personality and cultural background. Classifying people as 'high achievers' and 'low achievers', he suggests that high achievers make more successful managers than low achievers. According to McClelland, high achievers relish responsibility and seek out problems which offer challenge; he tends to set himself standards that stretch him and he derives satisfaction from their achievement. The need for positive feedback as a barometer of his performance is important to the high achiever. But with targets set too low, no challenge exists and hence no satisfaction is derived from achievement; at the other extreme, standards set too high tend not to motivate because of the high risk of failure. The high achiever is generally less directly concerned with money than the low achiever – because satisfaction flows from accomplishment – however, money reward may have significance in terms of being seen to be held in esteem. To the high achiever the opportunity for personal satisfaction from successfully accomplishing tasks is of essence. Clearly the need to identify the personal characteristics of the high achiever and the low achiever is essential, in the context of both the budget and general management, if the best is to be got out of people.

Maslow, Herzberg and McClelland in the context of budget motivation

Having summarised each of the above experts' theses, it is necessary to place their findings within the overall framework of budget motivation. Maslow's motivational hypothesis would suggest the need to stress those factors near the apex of the hierarchy of basic needs. Hofstede[38] interprets this theory with reference to the budget as follows. 'In the case of our budgeted managers, we can expect their . . . need fulfilment to be fairly high on the . . . pyramid. Therefore, attempts on budget motivation by building on the lower level needs for these people will be likely to have either no effect, or possibly a negative one. Positive budget motivation will only be possible by trying to fulfil the higher needs; esteem from others, self-esteem, and possibly some kind of self-actualisation.'

The implications of Herzberg's findings are evidently the need to stress, in the budget system, the presence of motivating factors and an adequate level of hygiene factors.

The relevance of McClelland's approach lies in the fact that the budgeted manager should seek challenge from the setting of budget standards.

But there are additional guidelines that can be gleaned from the rules of Maslow's and Herzberg's approaches to motivation. Rewards, in terms of salary increments, promotion, etc. are often based upon performance relative to budget – although this generally operates in parallel with superiors' interpretation of the level set in the budget. However, given Herzberg's findings that salary is generally either neutral or a dissatisfier – although Maslow's and McClelland's views of salary as fulfilling esteem desires must not be overlooked – it may be logical to sever the connection of budget performance and salary review. Ross[39] has shown that separating evaluation and control improves communication. This would tend to diminish feelings of injustice relative to budget performance. If salary and promotion are based, even in part, upon performance versus budget these injustice feelings may arise because of the varying subjective standards which managers set for themselves in the budget situation. Examples of varying standards include new managers, or managers setting their first budget standards, who may desire to achieve their initial budget, and set standards accordingly; managers who have regularly achieved budget may set increasingly demanding targets; and managers who, because they have frequently failed to reach budget, set increasingly more difficult – even fantasy–budget standards. These behavioural patterns are considered further later in this paper.

In the budget situation, Maslow's affiliation needs may be met by budgetees tending to develop informal groups who will resist budget pressures exerted by the controller's department. This sort of occurrence most often happens in an authoritative management environment, or where the control system is of an authoritative type (see the discussion of Likert's work earlier in this paper). Argyris[40] observed this tendency in a study of employee behaviour in relation to budgets.

Maslow's esteem needs, and Herzberg's recognition and achievement desires are relevant to the budget because managers obviously wish to succeed and be seen to succeed. Similarly Herzberg spotlights responsibility as one of the key motivators of managers – this suggests, for budgets, the need to stress participation in setting standards.

Other motivational theorists

Many other investigators have developed formulations to explain the behaviour of people and their business motivation.

> Vroom[41] is one example. His basic model is as follows:
> Motivation$=$f(Valence$\times$Expectancy)
> in which the concepts are defined as follows:
> Motivation: the force to perform a certain act.
> Valence: the orientation (preference of attainment above non-attainment) of a person towards a certain outcome of his act.
> Expectancy: the degree to which a person believes a certain outcome of his act to be probable.

In the budget context the Vroom formula becomes:

Budget motivation=
f [Valence of attaining budget
$\times$ Perceived influence on results
$+\Sigma$ (Valences of other effects of actions
$\times$ Expectancies of these other effects)].

in which the concepts mean the following:

Budget motivation: the force to take actions necessary to attain the budget.
Valence of attaining budget: the preference of attaining the budget above not attaining it.
Perceived influence on results: expectancy of the effect of one's action on budget results.
Valences of other effects of action: the preferences for these other effects.
Expectancies of other effects: the degree to which the budgetee believes these other effects to be probable.

Becker and Green[42] present precepts not dissimilar to McClelland. They accept that the level of aspiration of employees is related to their performance, and go on to show that the business firm may be highly influential in affecting levels of aspiration of employees. This, of course, would be confirmed by Herzberg.

Stedry[43] is also concerned with aspiration levels in budgeting. He set out to probe the impact of budget level on performance. He showed that aspiration level formation played a big part in actual performance, and that highest results were achieved by those with highest aspiration levels. Stedry's study affirmed the adage that budgets should be 'attainable but not too tight'. In a subsequent study with Kay[44], Stedry looked at the effect of more than one aspiration level. Goals were set either at a normal level (achievable 50 per cent of the time) or a difficult level (achievable only 25 per cent of the time). The findings of the researchers are interesting. Difficult goals appear to lead either to very good or very bad performance in comparison with performance with normal goals. In the case of the good results it appeared that the formal goal had become an aspiration level. But where very bad performance followed the difficult goal, the budgetee evidently perceived his target as being impossible, he failed to set an aspiration level and began to show withdrawal symptoms. Thus where the difficult goal was seen as a challenge (as it tended to be with the 'high achievers' and also with the younger participants), actual performance was better than target. But where the difficult goal was viewed as impossible, performance fell below even the normal goal.

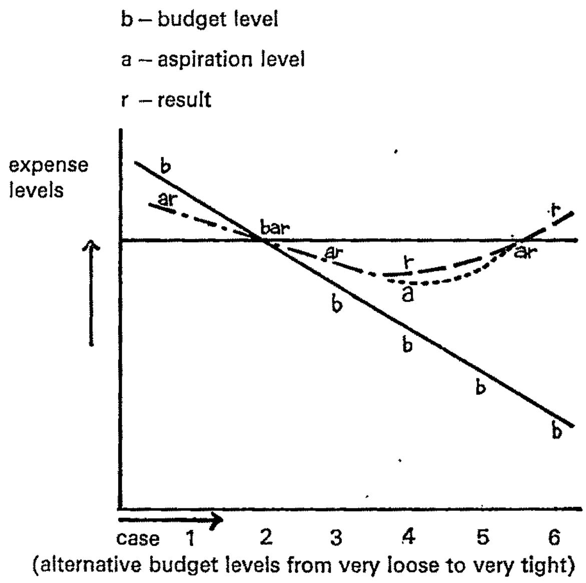
With regard to aspiration levels, Child and Whiting[45] have determined that:

> success generally leads to a raising of the level of aspiration, and failure to a lowering,
>
> the stronger the success, the greater is the probability of a rise in level of aspiration; the stronger the failure, the greater is the probability of a lowering.
>
> shifts in level of aspiration are in part a function of changes in the subject's confidence in his ability to attain goals.
>
> effects of failure on level of aspiration are more varied than those of success.

They also found some evidence to the effect that failure is more likely than success to lead to withdrawal in the form of avoidance of setting an aspiration level. We are sure that this is in line with many accountants' experience.

Hofstede's[46] research confirms many of the above findings. Defining aspiration level as that 'level of future performance in a familiar task which an individual, knowing his level of past performance in that task explicitly undertakes to reach', he tests the effect on outturn of varying degrees of 'tightness' in the budget. His findings are summarised in Exhibit III, which shows the level of expense on the vertical axis and the degree of 'tightness' of the budget on the

Exhibit III Hofstede's research findings



horizontal axis going from very loose on the left to very tight on the right.

It can be seen that as budgets become tighter the budgetee adapts his aspiration level to the budget level. In case three the actual results coincide with the aspiration level and although the budget has not been achieved, the actual results are better than normal. The budget in case four is much tighter, and although the employee was motivated and aspires to higher levels, his actual results fail to rise. After this point his aspiration and results fall because the budgetee no longer believes it possible to reach the budget level. In case six the budgetee looks upon the budget as being utterly impossible, and this creates negative motivation and performance deteriorates in sympathy.

The key findings of Hofstede's study are that performance improves when the following features are present in the budget process:

participation in the setting of the budget

frequent communication about cost and budget variances with the boss

knowing exactly which costs one is responsible for

frequent group meetings of the boss with subordinates.

Obviously different managers and supervisors will have different aspiration levels. It may be that controllers can affect actual performance by ensuring that high achievers are set challenging targets. But there is a difference between the challenging target and the impossible. What is challenging to one manager may be impossible to another, and it is our contention that the controller must be sympathetic to the aspiration goals of his managers if he is to achieve full effectiveness.

Budget biasing

As mentioned above, Child and Whiting showed that past budgeting performance affected aspiration levels. Lowe and Shaw[47] have also shown how past results *vis-a-vis* budget can influence the level at which future budgets are set. As would be anticipated, where budgetees 'are allowed to take part in a bargaining type process for fixing their own budget standards they tend to bias information according to the way in which they perceive themselves to secure greatest personal benefit'. Generally managers saw it in their personal interest to agree lower rather than higher budget standards. Similarly Schiff and Lewin[48] observed a tendency for managers in a participatory budget environment to bias budget costs upwards and revenues downwards. As Lowe[49] points out 'the rational economic behaviour of individual managers will be motivated by a desire to strike a balance between present security in retaining their job, and increasing future income. A manager in the budgeting process, may reason that a conservative forecast increases the likelihood of achieving a favourable budget performance in the coming budget period, and therefore his superior's approval then, but at the cost of possibly disappointing his superior now with the size of his present forecast. Where a manager has little or no goodwill left because of poor past budgeting performance he may well be tempted to make extravagantly high forecasts now in order to maintain his superior's present acceptance despite the possible dire consequences later. . . . In contrast the manager who has plenty of such goodwill stored up with his superior may well find it possible to temper his forecasts now with a view to obtaining more goodwill later.' Sometimes genuine over- or underestimation occurs. Here Lowe and Shaw[50] observed for level of sales budgeted that 'when sales . . . are rising there is a tendency to underestimate and when falling there is a tendency to overestimate the level'.

Budget communication

The direction of flow of budgetary control information within an organisation may have critical repercussions for its efficiency. The situation in which information flows from the budget controller's department upwards first to more senior management – a characteristic of the authoritative control systems referred to above – is clearly in breach of the control principles of Likert's system 4 democratic style of management in which communication is downwards, upwards, and with peers and is accurate.

In these circumstances the manager will, as McRae[51] observes, 'tend to feed up the kind of information he thinks his superior likes; and this will probably be information which causes least stress and tension.' As Argyris[52] says 'playing it safe is a way to keep the road to advancement open'.

Miles and Vergin[53] have appreciated the communications failure of traditional control systems and they have summarised their findings and precepts for a behaviourally sound control system as follows: 'The principal flaw in the traditional theory of control according to the behavioural scientists, is the assumption that control is exercised downwards in the organisation – by superiors or subordinates charged with carrying out detailed organisational assignments. In the traditional control model, its critics argue, the organisation is pictured as essentially machine-like. Control procedures are designed to monitor the machine's performance along a number of dimensions and to despatch various reports to upper level officials. Management, in this model, stands at the "control panel" alert to evidence of negative deviation from pre-established standards and procedures and ready to pull switches and twist dials to enforce compliance at any point at which such deviation may occur.'

'The behaviouralists grant that management may gather information on discrepancies and attempt to restore conformance. But, they argue, it is the individual organisational member who actually exercises control – who accepts or rejects standards, who does or does not exercise care in the performance of his duties, or who accepts or resists efforts to change his behaviour to achieve some objective or goal.'

'While behavioural scientists have generally not translated their criticism into detailed prescriptions for the design of control systems, it is possible to abstract from their statement some conditions which they feel must be present in the organisational environment and some requirements which they believe must be met by management control systems.

> Standards must be established in such a way that they are recognised as legitimate. This requires that the method of deriving standards must be understood by those affected, and that standards must reflect the actual capabilities of the organisational process for which they are established.
>
> The individual organisation member should feel that he has some voice or influence in the establishment of his own performance goals. Participation of those affected in the establishment of performance objectives helps establish legitimacy of these standards.
>
> Standards must be set in such a way that they convey "freedom to fail". The individual needs assurance that he will not be unfairly censured for an occasional mistake or for variations in performance which are outside his control.
>
> Feedback, recognised as essential in traditional control designs, must be expanded. Performance data must not only flow upward for analysis by higher echelons, but they must also be summarised and fed back to those directly involved in the process.'

It has also been shown,[54] in support of the desirability of downwards communication, that knowledge of results influences favourably future performance.

On other aspects of communication, is the budget account free from criticism? In our opinion the answer is no. The marketing maxim that the seller should use the tone of voice and the words that the consumer understands applies no less in the context of a budgeting framework. The budget accountant should be aware that non-accountant managers prefer to look at management information in terms other than a matrix of figures.

As Robert Townsend says[55] 'statements comparing budget to actual should be written not in the usual terms of higher (lower) but in plain English of better (or worse) than predicted by budget. This eliminates the mental gear changes between income items (where parens are bad) and expense items (where parens are good). This way reports can be understood faster'. Becker[56] suggests that accountants should look to the coding and receiving processes of the individuals to whom information is transmitted. This view is endorsed by Bruns,[57] Dyckman[58] and Birnberg and Nath.[59] All refer to the tendency of non-accountants to look literally at the title of an accounting document – for example a profit and loss account – and perceive it as just that. But they fail to appreciate how differences may arise by virtue of accounting treatments of say stock valuation, depreciation, profit on long-term contracts, etc. Solving the questions raised by this 'functional fixation' is outside the scope of this article but all accountants must be aware of its existence if they are to provide line management with the full support that it expects from finance men.

The budget system – punitive or supportive?

Both McGregor and Likert suggest that for the modern organisation to be wholly effective it is necessary that employees should see themselves as having supportive relationships to other employees. In this (perhaps Utopian) situation, the boss gives support to the employee as he wants the employee to be effective. From this it can be deduced that control systems would have the role of helping to make the manager more effective – that is, they would support him. But it has been suggested by Chris Argyris[60] (see below) that the way in which accountants operate budgetary control systems is punative rather than supportive.

Budgets and people

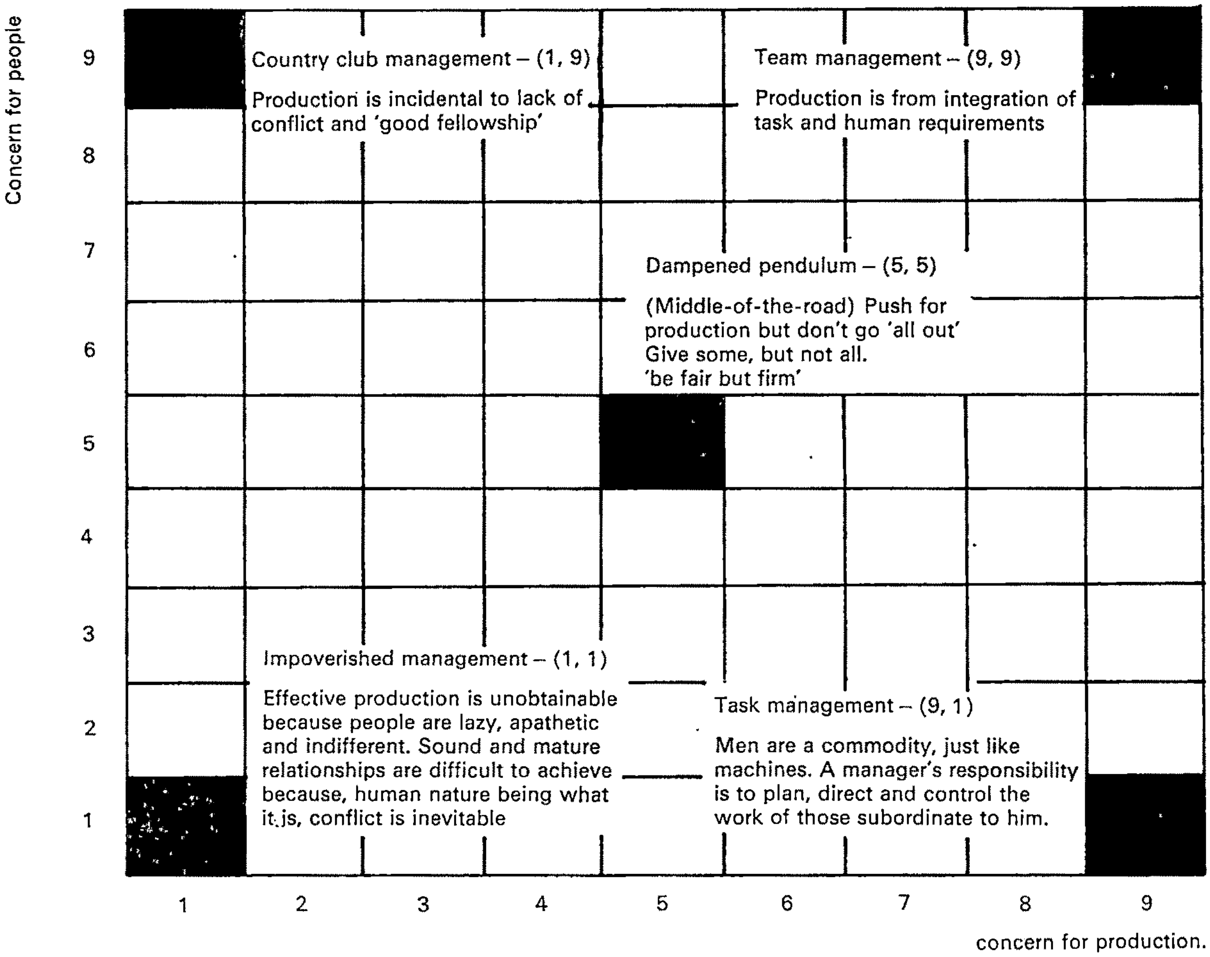
The major study of the effect of budgets on people – by Chris Argyris[61] – was undertaken some 20 years ago. Nonetheless, the findings are relevant now if, as for example, Caplan[62] believes, cost accounting systems are still based on the assumptions of an authoritative model of behaviour. Argyris set out to examine the effects of budgets on people in organisations. He observed that budget staff viewed their role as essentially one of criticism. They perceived themselves as watchdogs looking for and reporting to top management deviations from plan. The budget staff looked upon the budget as being a means of applying pressure and offering a challenge to line employees. Line supervisors objected to the method of budgetary control in the organisation because:

> it merely reported results without commenting on reasons for the results.
>
> the accountants were considered inflexible.
>
> the budget staff were always increasing pressure by increasing targets. This was resented because it implied that they (the line) lacked adequate interest in their job and would not be interested were it not for the budget.
>
> the budgets were always set unrealistically high.

Supervisors suggested that these problems could be overcome if accountants saw the other person's point of view; and further realised that budgets were only opinions and were not final. Argyris reports an astounding degree of aggression against the budget department, which is perhaps not surprising given first that the budget system in Argyris' study appeared to be a policing mechanism, and second that 'success for the budget supervision means failure for the factory supervisor'.[63] Some of the supervisors' comments about accountants were indicative of a control system that was anything but supportive. 'Most of them are warped and they have narrow ideas.' 'They don't know how to handle people.'[64]

In the jargon of the 'managerial grid', the average budget accountant is a truly 9, 1 manager. What is

Exhibit IV The managerial grid


Concern for people
9
8
7
6
5
4
3
2
1
Country club management – (1, 9)
Production is incidental to lack of conflict and 'good fellowship'
Team management – (9, 9)
Production is from integration of task and human requirements
Dampened pendulum – (5, 5)
(Middle-of-the-road) Push for production but don't go 'all out' Give some, but not all. 'be fair but firm'
Impoverished management – (1, 1)
Effective production is unobtainable because people are lazy, apathetic and indifferent. Sound and mature relationships are difficult to achieve because, human nature being what it is, conflict is inevitable
Task management – (9, 1)
Men are a commodity, just like machines. A manager's responsibility is to plan, direct and control the work of those subordinate to him.
1
2
3
4
5
6
7
8
9
concern for production.

(See Reference 66.)

meant by this is explained by a brief examination of Blake and Moulton's[65] thesis. Their initial assumption is that management should aim to foster environmental attitudes conducive to efficient performance and in so doing they must stimulate creativity, innovation, experimentation and enthusiasm for the job. The managerial grid combines the two key elements of business behaviour, namely concern for production and concern for people. In this context 'concern for' is associated wih the management style of the executive. 'Production' is not limited to factory manufacturing techniques, but may refer to any task of management – excluding the management of people, which falls into the other heading – for example research and development, level of sales, the logistics of depot locations, etc. Concern for people encompasses all aspects of human relations, personal motivation and inter-personal contact.

With these two concerns – for production and for people – on axes as shown in Exhibit IV, it is comparatively easy to summarise a manager's style in relation to the maximum possible of 9.

Thus 9,1 management, or 'task management', focuses wholly upon production and the manager in this category can generally be said to have acute problems in dealing with people, but to be exceptionally competent technically. The 9,1 management style is entirely geared to high level productivity – at least in the short term. Superiors make decisions, subordinates carry them out without question. But this system has inherent weaknesses because subordinates will be working in an environment where none of Herzberg's motivators are present – achievement, recognition, responsibility and advancement will probably be absent and the nature of the work will not stimulate. Such factors as company policy and administration, salary, interpersonal contacts and working conditions must therefore all be acceptable if industrial strife is to be avoided. Shop floor conditions in the motor industry are a good example of the 9,1 management style, and the fact that its record of industrial relations is punctuated with disputes is indicative of the shortcomings of the task management style. It is also possible that this style of leadership is a major contributor to the polarisation of superior and subordinates, which results in the 'Them' and 'Us' thinking[67] which is at the root of so many industrial disputes.

By contrast the 1,9 style, or 'country club management', emphasises people to the exclusion of their performance. People are encouraged and supported, but their mistakes are actually overlooked, because they are doing their best – the maxim of 'togetherness' applies. Direct disagreement or criticism of one another must be avoided at all costs and hence production problems are not followed up. This style of management can easily evolve when competition is limited, for example, the mature oligopoly.

The ideal of the managerial grid is to move towards the 9,9 style, and Blake and Moulton advocate a phased organisational development programme with this as the goal.

On the evidence presented here the budget accountant falls into the 9,1 category; it is hoped that this paper may help him to increase his concern for people and thereby move upwards in the managerial grid.

Conclusions

We now bring together our examination of available research findings into a series of guidelines which we would regard as being indicative of good budgeting practice given the implications of behavioural science. They are:

in terms of setting standards, maximum participation should be sought. As Robert Townsend[68] says 'budgets must not be prepared on high and cast as pearls before swine. They must be prepared by the operating divisions. Since a division must believe in the budget as its own plan for operations, management cannot juggle figures just because it likes to. Any changes must be sold to the division or the whole process is a sham.' But the need for an in-depth review of budgets prepared on a participatory basis is paramount.

information flow should be downwards, upwards and with peers; *not* just upwards.

frequent communication about cost and budget variances with the boss

managers should know exactly which costs they are responsible for

frequent group meetings of the boss with his subordinates

performance is clearly of essence in giving salary and promotion rewards. But in making these assessments of how well managers have performed it may be wise to leave the budget outside the appraisal

budget accountants should communicate in the language of the person with whom they are dealing

budget accountants should be prepared to be humble in explaining their presentations. They must remember that non-accountants may not appreciate how variations may arise through different stock valuation methods, different depreciation methods, etc. In other words the non-accountant literally believes the title of the document – for example profit and loss account – with which he is presented.

everything should be done to make the budget – and indeed any control system – supportive rather than punitive; the aim should be towards self-control rather than a policing mechanism

the budget should not be used to pressurise line management

the budget accountant must be sensitive to the reactions of management and supervisors to his control mechanisms

focus should be on efficiency variances. Variances that arise purely from accounting treatment should be omitted.

budgets which are attainable but not too tight are the best motivators.

It is also of essence that the budget accountant understands the ways in which managers play the game of budget control, for instance:

'difficult' budget goals may lead either to very good or very bad results compared with budgets set at a 'normal' level. The difficult budget may either be perceived by the high achiever, to whom it represents an aspiration level, as a challenge, or by the low achiever as impossible

managers like to achieve budget since in so doing they fulfil esteem and achievement needs

success generally leads to a raising of the level of aspiration, and failure to a lowering

the stronger the success, the greater the probability of a rise in level of aspiration; the stronger the failure, the greater is the probability of a lowering

shifts in level of aspiration are in part a function of changes in the subject's confidence in his ability to meet goals

effects of failure on level of aspiration are more varied than those of success

failure may lead to withdrawal in the form of avoidance of setting a level of aspiration. This withdrawal, if failure persists, may lead to a complete breakdown in communications, and personal and industrial relations problems.

managers may bias standards conservatively in order to ensure that they achieve budget, arguing that superiors' short-term dissapproval at a conservative budget will be compensated by approval when their budget is more than achieved. This tendency to play it safe more frequently occurs in an authoritative organisation

when a manager has a poor track record of budget performance he may be tempted to make extravagantly high forecasts in order to gain short-term approval, despite probable dire consequences later

when sales levels are rising there is a tendency to underestimate sales outturns; when falling the tendency is towards overestimation.

What we have tried to do in this paper is to summarise some of the findings of behavioural science on the topic of the budget. Necessarily our approach has been brief and all of the theories and research work to which we have referred clearly say much more than we have reported here. However, we hope that we have made readers aware of some of the ways in which employees react to budgets. We further hope that we have shown that budgets are powerful behavioural tools and if their use is to result in consistently desirable results it is important that accountants in budget departments should be aware of their behavioural implications.

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Equity Accounting and Investment Value

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1. Introduction

The recently published Statement of Standard Accounting Practice, 'Accounting for the results of Associated Companies', recommends that where an investor company holds between 20 and 50 per cent of the participating share capital of an investee company, the value of the investment shown on the investor's consolidated or equity balance sheet should be the historic acquisition cost, plus or minus the investor's share of the profits or losses (less dividends) of the investee subsequent to the date of acquisition.[1] Several fundamental issues are raised by this proposal, for example the effectiveness of consolidated or equity statements as a communication device compared with that of segmented reports. These wider issues will not be discussed in the present paper, the purpose of which is to explore the following valuation problem posed by equity accounting: whether the book value of the investment under equity accounting reflects the true worth of the investment. For example where the investee comprises a short-lived project or venture, its reported earnings may in certain situations include returns of capital invested. Thus there may be double-counting when reported earnings of the investee are added to the purchase price to represent the value of the investment – the familiar problem of failing to distinguish between the fruit and the tree.

The value of an investment may be defined in a number of ways; in the present context its true value is assumed to be identical with the normalised current market value of the investment.[2] The market value of the investment, in turn, is assumed to be given by the capitalised value of the stream of future net earnings or, alternatively, the stream of future dividends or of net cash receipts generated by the investment.[3]

In this exposition, the following assumptions are made:[4]

(*a*) The true worth of the investment, that is, its market price is given by the present value of its expected earnings. It is assumed that earnings accrue at the end of each period.

(*b*) There is consensus in the market on the magnitude and timing of these expected earnings.

(*c*) The discount rate employed by the investor is the company's cost of capital. The appropriate discount rate is the company's opportunity cost of funds, that is, its incremental return on investment. A perfect capital market is assumed so that the borrowing rate is equal to the lending rate, and the discount rate employed by all investors to appraise investment value is the same.

(*d*) It is assumed that the quality of earnings is homogeneous between investments.

A number of alternatives is considered below in relation to three investment opportunities: an investment promising an infinite constant earnings stream, an investment in an infinite earnings stream with fluctuating earnings, and an investment in a company with a limited life.

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[1] 'Accounting for the results of Associated Companies', *Accountancy*, February 1971, pp. 61–5. Hereafter referred to as 'equity accounting'.

[2] Normalised current market value refers to a current market price with seasonal and random day-to-day price fluctuations averaged out.

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[4] The use of qualifying assumptions permits examination of a highly simplified model, without impairing the generality of the conclusions.

2. A perpetuity-type investment

Case A

The present value of an investment promising an infinite earnings stream is given by:

$$P_o = \sum_{t=1}^{\infty} E_t (1+i)^{-t}$$

where

P_o = present value of investment, that is, the purchase price to the investor at t_o

E_t = expected earnings in period t

i = the appropriate discount rate.

The above equation reduces to the form $P_o = Ei^{-1}$ when earnings are constant in all periods.[5]

Assume that a company invests in part of a project (between 20 and 50 per cent) and expected earnings from this investment are $8,000 a year in perpetuity. The company's cost of capital is 10 per cent, and the purchase price the company pays is equal to the present value of the earnings stream.

$P_o = \$8{,}000\ (\cdot 1)^{-1} = \$80{,}000$

If all earnings from the project accrue to the investor as dividends at the end of each period, then the current worth of the project at any time would be the same as its purchase price, other things remaining equal.

On the other hand, suppose the policy of the project management is one of retaining a certain proportion, say 50 per cent, of earnings each year which is reinvested to earn 10 per cent, and this policy is known to investors. Since the investee's reinvestment rate has been assumed equal to the investor's cost of capital, the present value of the project to the investor at the time of purchase would be the same as in the situation where all earnings are paid out, i.e. $80,000. The position at the end of, say, two years is given below.

		$	$
	Cost of investment at t_o		80,000
	Earnings in period t_o to t_1	8,000	
less	Dividends in period	4,000	4,000
	Book value of investment at t_1		84,000
	Earnings in period t_1 to t_2	8,400	
less	Dividends in period	4,200	4,200
	Book value of investment at t_2		88,200

The investor's book value of the investment at t_2 is equal to the present value of the expected future earnings, and thus reflects the true worth of the investment. A simple way of demonstrating this is to consider the price a new investor, whose discount rate is also 10 per cent, would be willing to pay to take over the investment at t_2. Assume for convenience that all earnings are now expected to be paid out in future years. (As noted above, there is no difference in the purchase price under the alternative assumption that a proportion of the earnings is reinvested at 10 per cent.)

The expected earnings in future periods would be $8,820 ($8,000+10% of $4,000+10% of $4,200), and the purchase price equivalent to the present value of the investment to the new investor at t_2 is $8,820 (.1)$^{-1}$ or $88,200.

It can be similarly demonstrated that, given the assumptions stated earlier, under equity accounting the true worth of an investment with an unlimited life span will be recorded, where a variety of pay-out policies is assumed. But if the assumptions are relaxed to permit changes of expectations, affecting the magnitude or timing of future earnings or the discount rate, the investor's book value will no longer reflect the true investment value on account of the revised expectations.

It is a necessary condition of the above retained earnings model that the investee's reinvestment rate is equal to the investor's discount rate. If this assumption is removed, the equality of the investor's book value and the true investment worth will not be achieved. Suppose an investee were to reinvest all its earnings in the first three years at 10 per cent and distribute all earnings thereafter, to give the following earnings pattern: t_1, $8,000; t_2, $8,800; t_3, $9,680; t_4, and succeeding years, $10,648.

If the discount rate is also 10 per cent, the present value of the investment to the investor at t_o is $106,480 (1.1)$^{-3}$ or $80,000. As has been demonstrated above, if this also represents the purchase price, then the investment book value (in the investor's books) under equity accounting reflects the true investment value in all periods.

The situation is very different if a discount rate of, say 5 per cent, is employed by the investor to evaluate the investment.[6] The present value at t_o is $212,960 (1.05)$^{-3}$ or $183,961. Thus the investor's book value of the investment at t_3 is $210,441 (cost $183,961+ retained earnings $26,480), compared with a present value at that date of $212,960. The difference may not be significant; it is a function of the investee's retention ratio, the relationship of its reinvestment rate to the investor's discount rate, and the period over which earnings are retained.

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[5] It can be shown that the present value of a constant earnings stream for n periods is given by $P_o = E\frac{1-(1+i)^{-n}}{i}$; where the earnings stream is a perpetuity, $P_o \simeq Ei^{-1}$, since $(1+i)^{-n}$ tends to zero as n tends to infinity.

[6] The present value of the perpetuity stream at t_3 is $10,648 (·05)$^{-1}$ or $212,960, which gives a present value at t_o of $212,960 (1·05)$^{-3}$ or $183,961.

3. An investment in a fluctuating earnings stream

Case B

Consider an investment with an earnings pattern comprising alternating low and high earnings. Expected earnings are \$1,000 at $t_1, t_3, t_5, \ldots$ and \$2,000 at $t_2, t_4, t_6 \ldots$ The present value of the investment is given by[7]

$$P_0 = \frac{E'(1+i)+E''}{(1+i)^m - 1}$$

where

E' =earnings at $t_1, t_3, t_5 \ldots$

E''=earnings at $t_2, t_4, t_6, \ldots$

m =number of years in an earnings cycle.

At 10 per cent the value of P_0, the purchase price of the investment, is \$14,762. If it is assumed that all earnings are distributed, the present value of the earnings stream at the end of years $t_1, t_3, t_5, \ldots$ is \$15,238, and that at the end of years $t_2, t_4, t_6, \ldots$ is \$14,762. Thus the investor's book value coincides with the present value of the investment every two years. Similarly, if the earnings stream has the following recurring time pattern: $E_1, E_2, \ldots, E_n$, then the book value will coincide with the present value of the investment every n^{th} year.

Case C

There is an infinite variation in the time pattern of earnings streams. Consider, for example, the case of a company set up to exploit a new product. It is expected that initial earnings will be low, followed by a period of abnormally high earnings, which is in turn succeeded by a long period of normal stabilised earnings. Expected annual earnings from an investment in the equity of this company are at t_1, \$1,000; t_2, \$1,000; t_3 to t_7, \$8,000; and \$4,000 at the end of all succeeding periods. The present value of the investment is given by

$$P_0 = \sum_{t=1}^{n} E'_t(1+i)^{-t} + E''i^{-1}(1+i)^{-n}$$

where

E' =annual earnings preceding the normal stabilised earnings stream

E''=annual normal stabilised earnings

n =number of years preceding the normal stabilised earnings stream.

At 10 per cent, the value of P_0, the purchase price of the investment, is \$47,324. If it is assumed, for simplicity of illustration, that all earnings are distributed, the investor's book value of the investment at \$47,324 will diverge significantly from its present value at the end of each period, as shown in Table 1. The present value of the investment is greater than its book value in the initial periods, the former is at a peak when the stream of high earnings is reached at the end of the second year, and declines to \$40,000 the present value of the normal stabilised earnings stream, at t_7.

TABLE 1
Present values of a perpetuity stream with fluctuating earnings

At end of year	*Value of investment* \$
1	51,054
2	55,163
3	52,679
4	49,947
5	46,942
6	43,637
7 and succeeding years	40,000

To conclude, where the earnings stream from an investment is of a fluctuating nature or where there are bunched earnings, the true investment value is unlikely to be discovered under equity accounting principles.

4. An investment in a company with a limited life span

Case D

The present value of an investment which is expected to yield a stream of earnings for a limited number of years and a return of capital funds at the end of the period is given by

$$P_0 = E_1(1+i)^{-1} + E_2(1+i)^{-2} + \ldots + E_n(1+i)^{-n} + R(1+i)^{-n}$$

$$= \sum_{t=1}^{n} E_t(1+i)^{-t} + R(1+i)^{-n}$$

where n is the number of years of life and R is the residual value of the investment.

Assume that the investee company is an industrial company with a limited life of five years and the investment promises an earnings stream of \$8,000 a year *after depreciation.* Assume, for simplicity of illustration, that the investee's book value[8] of the underlying assets (including depreciable assets) at the beginning of the period is \$80,000 and that the expected residual value at the end of the period is also \$80,000. At 10 per cent the purchase price of the investment is

---

[7] The present value of the E' earnings stream at t_{0-1} is $\frac{E'}{(1+i)^m - 1}$, hence its present value at t_0 is $\frac{E'(1+i)}{(1+i)^m - 1}$. The present value of the E'' earnings stream at t_0 is $\frac{E''}{(1+i)^m - 1}$.

[8] This is the only reference in the illustrations given in this article to the book value of assets in the investee's books. All other references to book value are to the recorded value of the investment in the investor's books.

$$P_0 = \sum_{t=1}^{5} \$8{,}000\,(1.1)^{-t} + \$80{,}000\,(1.1)^{-5}$$
$$= \$80{,}000$$

This case is in fact analogous to an investment in a perpetuity stream, since the productive capital of the investee company has been maintained and is available to the investor for reinvestment elsewhere in the economy at the end of the investee's life. As in the perpetuity-type investment example, it can be easily demonstrated that, given certain simplifying assumptions, the true worth of the investment will be recorded in the investor's books under equity accounting, irrespective of the distribution policy adopted by the investee company.

Case E

Consider now the case of an investment in the equity of an associated company which comprises a mining project with a limited life. Typically, the main asset of a mining company, that is, the minebody *in situ*, is not reflected in its balance sheet. Thus the book value of its assets and its market capitalisation may bear little or no relationship to one another. The deficiency of equity accounting procedures in recording investment value in these circumstances can be demonstrated by the following simple model.

Assume that a company invests in part of the equity of an associated company, which operates a mine with a limited life. The investee company's assets comprise mining property and plant, which are fully amortised and have no residual value. Expected earnings from the investment are \$8,000 a year for five years; the investor company's cost of capital is 10 per cent, and it purchases the investment at an amount equal to the present value of the five years' expected earnings capitalised at its cost of capital.

$$P_0 = \sum_{t=1}^{5} \$8{,}000\,(1.1)^{-t} = \$30{,}326$$

If all earnings are paid out, the present value of the investment at the end of each of the five years is given in Table 2.

TABLE 2
Present values of an annuity stream

At end of year	*Value of investment* \$
1	25,359
2	19,895
3	13,884
4	7,273
5	0

It is evident that there is in the above case no justification for retaining the investment in the investor's books at its original cost. Rather, the cost should be amortised to reflect the above value pattern.

Alternatively, if all earnings are retained by the investee and reinvested at 10 per cent, the value of the terminal pay-out at the end of the five years would be

$$P_5 = \sum_{t=1}^{5} \$8.000\,(1.1)^{5-t} = \$48{,}841$$

where P_5 is the terminal dividend.

The investor's book value of the investment at the end of the period (before payment of the terminal dividend) will amount to \$79,167 (original cost \$30,326+retained earnings \$48,841) and will exceed the terminal dividend by the full amount of the original purchase price. It is evident that the recorded book value will overstate the true worth of the investment in all periods. For example at t_2 the investor's book value will be \$47,126 (original cost \$30,326+ retained earnings \$16,800) compared with a present value of the terminal dividend three years hence of \$48,841 $(1.1)^{-3}$ or \$36,695.

A similar result obtains where earnings are partly distributed and partly reinvested.[9]

Case F

Given accounting depreciation practice and assumptions of certainty and perfect markets, under equity accounting the true value of a short-lived investment will be recorded when *the investee's earnings expressed as a rate of return on the residual value of its net assets is equal to the earnings capitalisation rate employed in evaluating the investment.* This situation is analogous to that of an investment in a perpetuity stream, as has been noted. Where this condition does not obtain, then equity accounting procedures will not give a true investment value.

Most investment situations will lie between the two extreme models demonstrated in cases D and E in this section. That is, there is usually some residual value at the end of the investment life, but the residual value will not bear the relationship to the earnings stream assumed in case D. There is, firstly, a price level problem. The market value of the investee company's net assets at the beginning of the investment period may be (and usually is) greatly in excess of their book value as recorded in the investee's books; under historical cost depreciation accounting only the book value of the assets will be maintained. The earnings stream may be relatively constant throughout the period, but even if a proportionate fall in productive capacity on account of inadequate historical cost depreciation accounting provisions is assumed, the value of the investment in the investor's books will be overstated under equity accounting procedures. Secondly, a difference may exist between the rate of return on the investee's assets and the earnings capitalisation rate.

---

[9] The difference between the investor's book value of the investment and its present value at the end of each period is the same irrespective of the investee's dividend policy, if it is assumed that the investee's reinvestment rate is the same as the investor's discount rate.

To conclude, in the majority of investments in associated companies with a relatively short life, equity accounting procedures will be deficient in recording the true investment value.

5. Conclusion

The above illustrations refer to investments in expected earnings streams under assumptions of certainty and perfect markets, but the principles underlying an investment in the real world in the securities of an associated company are basically similar, and the conclusions may be extended to investment under uncertainty.

Equity accounting is an improvement on historical cost accounting and represents progress towards better reporting in the financial statements. Using highly simplified models, analysis in this paper has been focused on the book value of the investment in the associated company that is recorded under equity accounting principles. It was demonstrated that in two investment situations (cases A and D), equity accounting would give an investment value in the investor's books equal to the true value of the investment. But this equality does not hold for the other investment situations examined above.

Given the assumptions in this paper, an acceptable definition of the true value of an investment in an associated company is given by the current market value of its securities. Since equity accounting procedures already represent a departure from historical cost principles, a strong case can be made for abandoning historical cost altogether and recording the investment in normalised current market value terms. Such a proposal may not be acceptable to all accountants. The vagaries of share price fluctuations are well documented; further, the securities representing the investment may not be listed on the stock exchanges. However, accountants must realise that rigid adherence to a mechanical formula in determining investment value will produce misleading results in many investment situations. Intrinsic investment value is a function of the size, time pattern and uncertainty of future cash flows and the discount factor. In applying equity accounting principles, particularly with respect to terminal investments or investments with significantly fluctuating or bunched earnings, accountants must have regard for the real determinants of investment value, or serious distortions of the investor's financial position may result.

Book Reviews

Understanding Modern Business Mathematics

A. M. C. Morison, R. Burden and M. G. Crabtree, (*The Institute of Chartered Accountants of Scotland,* £3)

Until some twenty years ago little had been written of an analytical nature about the problems of running, and making decisions in, an organisation. Most of the accounting literature was descriptive, concerned primarily with the mechanics currently being utilised for recording and reporting financial information. An increasingly complex business environment and the development of electronic digital computers, however, have led to the development of a more rigorous body of management literature. Techniques have been developed which attempt, sometimes unsuccessfully, to link available opportunities and resources to organisational objectives in such a way that the latter are, as far as possible, optimised. To make full use of the available techniques the modern manager must understand both the techniques and the initial models upon which they are based. Most economic, and hence management, models do not fall into the category of physical reproductions of the real world for obvious reasons. Their form is usually more abstract; verbal, diagrammatic or, most frequently, mathematical.

Consequently, today's manager is likely to find the little mathematics he remembers from his schooldays, inadequate for him to grasp the full relevance of the new range of management techniques available. As a minimum he will probably require a basic knowledge of the calculus, linear programming, probability theory and elementary statistics. To acquire some of this knowledge, he could do very much worse than turn to 'Understanding Modern Business Mathematics', a primer written for non-mathematicians and published by the Institute of Chartered Accountants of Scotland. The book is not, nor does it claim to be, an advanced mathematical treatment of current management theory. Rather, it introduces the reader to some of the mathematical problems he is likely to encounter in applying the wide range of techniques presently being promulgated in the accounting literature.

In many ways the book succeeds in its aims. It is written with humour and sympathy for the non-mathematical student. The rigour of a mathematical proof is often sacrificed in the cause of greater comprehensibility, an acceptable practice in a text specifically addressed to a non-mathematical audience. The authors concentrate on explaining the reasons for the usefulness of various mathematical areas and their limitations in solving business problems. As early as page 23, the reader is put on guard: '... the truth of any conclusion is no greater than the truth of the premises from which it is derived; logic is concerned with the validity of the reasoning, not with the truth of the answer'. This statement suggests a danger which is inherent in all mathematical solutions to management problems that the precision they suggest may be illusory. The output is unlikely to be more accurate than the input data which are used.

The book covers a wide and relevant range of mathematical topics including mathematical logic, symbolic logic, probability theory, permutational and combinational analysis, elementary statistics, differential calculus, matrix algebra and linear programming. It is towards the last of these topics that the greatest criticism may be levelled. Of the numerous mathematical techniques developed in recent years, linear programming is perhaps the most important to accountants. It is a fundamental tool to use in solving optimisation problems where resources are not available in unlimited supplies. Further, it provides, by its generation of dual prices, measures of the marginal profitability (or opportunity cost) of scarce resources, information which has a multiplicity of uses, for example, in problems of pricing, divisional or decentralised control, transfer pricing and so on. The linear programming chapter in the book deals only with the limited graphical method of solving linear programming problems and fails to mention either the existence or the applicability of dual prices.

This criticism apart, the book is likely to provide a helpful introduction for managers to some of the mathematical problems encountered in using modern management techniques. The chapter on the calculus, a frequent problem area for non-mathematicians, is a particularly clear exposition of basic principles with an interesting final section concerned with practical applications.

The authors point out that the chapter on symbolic logic is required reading for parents whose children are studying the 'new' mathematics. The same comment may apply to the linear programming chapter for some parents with teenage offspring reading secondary school mathematics. It may be that educating future generations in management may prove a less arduous task than it is at present!

The book contains just over 250 pages and at £3 is not cheap for a paperback. The price is unfortunate, for although it may not deter potential readers from the management sphere, it may prove too high for management students and others who have a more peripheral interest in business and finance.

John Arnold

Management Accounting and Behavioural Science *E. H. Caplan* (*Addison Wesley*, 1971)

It is a characteristic of all truly original contributions to the social sciences that once discovered and stated they seem obvious to the point of banality.

The accounting profession is indebted to Professor Chris Argyris for pointing out the now obvious fact that accounting statements affect human behaviour and that in designing accounting statements we accountants cannot avoid building certain assumptions about human nature into these statements. These assumptions may be valid or they may not. Argyris examined some of these assumptions built into budgetary control systems and found them wanting.

Since Argyris' path breaking work back in 1951 a good deal of research has been carried out in this area. In the book under review Professor Caplan attempts to review this rather loosely structured field of research.

The book reviews and compares the classical and modern views on employee motivation and behaviour and suggests that most accounting control systems follow the classical (traditional) view despite the considerable weight of recent research evidence indicating that the classical view is no longer tenable.

The second half of the book examines some recent contributions from social psychology which are relevant to cost accounting, budgeting and performance measurement. The comments on the 'transfer pricing problem' and human asset evaluation are particularly stimulating.

This is the first book to be published on an interesting aspect of accounting. It does not pretend to depth but provides a most lucid and helpful summary. The comprehensive bibliography is useful.

I recommend the book as suitable background reading for a one-term course on behavioural aspects of accounting.

T. W. McRae

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Contributors to Accounting and Business Research

Volume 2 No 6 Spring 1972

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Inheritance Tax Studies

Thanks to a grant from the P. D. Leake Committee **Accounting and Business Research** is offering a first prize of £250 for the best article on Inheritance Tax to be received by 30 September. There will also be a prize of £50 for the article adjudged to be the second best. Normal rates will be paid for the third best article contributed.

It is hoped that the prize-winning articles will be published in **Accounting and Business Research.** Entries of sufficient merit received before 31 August may be included in the Autumn issue and others in later issues.

The best articles submitted will be printed and made available at the Institute's course on Inheritance Tax to be held in November, at which it is expected that the Chancellor of the Exchequer will be present.

R. G. Leach Fund Award

The Trustees of the R. G. Leach Fund, who financed the original launching of **Accounting and Business Research**, offer a prize of £100 for an article, on any subject, published in the journal in 1972. The award will be in addition to the normal fee paid for articles in **Accounting and Business Research.** The judging will be done by an independent panel who will take into consideration the originality of the article and its relevance to current financial problems.

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Profit Incentive: Earnings less Cost of Capital

Reuben E. Slesinger and Paul H. Jeynes

All businesses in the private sector strive to maximise profits out of any sales and revenues obtainable or permitted by commission regulation.

This truism is reflected in the standard form of the income statement, even though the term 'profit' does not appear there. Expenses (wages and salaries, raw materials, repairs, taxes, advertising and merchandising costs, etc.) are first deducted from revenues (sales) to find *gross income*. If the firm has borrowed capital funds, interest on that debt must then be subtracted to determine the company's *net income*. Interest obligations are assuredly no part of company profit; in fact, many accountants refer to such payments as 'interest expense', representing the cost of *debt capital*.

What about the cost of equity capital, particularly the *cost of common equity capital*? Should not that be deducted from *net income* for the same reason – because it is assuredly no part of company profit? If any portion of net income is properly regarded as a *cost*, then that part is desirably *minimised* like any other cost; it must be sharply distinguished from the remainder of net income that is to be *maximised*. Such remainder of net income which the firm endeavours to *maximise* is preferably identified as *Profit Incentive*, thus:

Profit Incentive=Earnings less Cost-of-capital.

The discussion that follows centres around this perhaps unfamiliar concept of Profit Incentive, so defined.

Exactly how much of reported net income is properly regarded as a cost, no part of company profit, and to be minimised?

Most theorists accept the view that the cost of common equity is a hypothetical discount rate which investors – in theory, if not in actual practice – apply to anticipated future receipts of some sort (earnings per share, or dividends per share, or dividends plus capital gains per share are among the several suggestions) in order to reproduce current market price per share.[1] Some insist that 100 per cent of realised earnings per share constitutes the cost of common equity and supplies the appropriate discount rate, meaning that net income must contain zero Profit Incentive.[2] At the opposite extreme, most financial analysts and magazines of business insist that net income is 100 per cent profit, meaning that the cost of common equity must be zero!

Harmful results of this troublesome controversy are far-reaching and pervasive, although largely unrecognised. Two especially mischievous aspects of the situation, to be discussed, are:

(i) Misleading indices to company performance, and

(ii) Disastrous effects on managerial decisions, corporate profits, and the national economy.

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[1] (*a*) Diran Bodenhorn, 'On the Problem of Capital Budgeting', *The Journal of Finance*, Dec. 1959.

(*b*) Myron J. Gordon, 'Dividends, Earnings, and Stock Prices', *The Review of Economics and Statistics*, May 1959.

(*c*) Alexander A. Robichek and John G. McDonald, 'The Cost of Capital Concept; Potential Use and Misuse', *Financial Executive*, June 1965.

'In ranking projects by some rate-of-return method, current literature favours the use of the internal rate of return, r, sometimes called the discounted-cash-flow rate of return' (p. 20.)

Few advocates of the Discounted Cash Flow approach appear to realise that DCF theory amounts to no more than the flat assertion that net income is 100 per cent cost-of-capital. See Tables III and IV, herein,

[2] Two typical examples:

(*a*) Ezra Solomon, 'Introduction: A Summary of Recent Trends in Research', *Financial Research and Management Decisions* (Alexander A. Robichek, editor), John Wiley & Sons, 1967.

'For equity capital the accepted idea is that we measure the ratio of future (perpetualised) net earnings from existing assets to current market value.' (p. 6.)

(*b*) Peter B. Linhart, 'Some Analytical Results in Tax Depreciation', *The Bell Journal of Economics and Management Science*, Vol. 1, No. 1, 1970.

'The discount rate of the firm *is* the actual rate of return . . .' (p. 95.)

Net income versus profit

The Federal Trade Commission and the Securities and Exchange Commission publish many pertinent financial details of business enterprises in their Quarterly Financial Report for Manufacturing Corporations. In evidence of the widespread interest in and use of such statistics is the popular reception accorded *Fortune's* Annual Directory of the 500 Largest Industrial Corporations (also the 'Second 500', etc.), and *Business Week's* Quarterly Summary of Corporate Performance. Both *Fortune* and *Business Week* refer to net income as 'profits', meaning that the cost of common equity must be regarded by them as zero!

Business Week is quite specific on this subject. The glossary of terms appearing on page 42 of the 8 May 1971 issue contains the following definitions:

> *Profits*
> Net income before extraordinary items. For banks, profits are before security gains or losses.
> *Margins*
> Net income before extraordinary items as percentage of sales.

Fortune takes a little different view. The figures reported as 'net income' are referred to as *profit*; but it is said that 'dividends paid on preferred stock, if any, have in most cases been deducted'. Thus, *Fortune* recognises that *in most cases* preferred dividends are a cost-of-capital and to be minimised, while insisting that no part of reported earnings per (common) share is a cost-of-capital!

It would appear, then, that both of these journals are content to accept earnings per share (alternatively, net income per share) as the appropriate index to company performance. And that seems to be the conclusion of *Barron's*, the national business and financial weekly, whose Statistical Section, 'Stock Market at a Glance', reports earnings per share for the latest accounting period and for the previous year – along with market prices and dividend rates – for all stocks traded.

It is understandable that earnings per share should be of interest to investors, because their return on their investment (purchase price) of shares held is made up of:

(*a*) Cash dividend payments, and

(*b*) Capital gains, or increase in market price above purchase price per share.

Both dividend payments and market price are, to large degree, functions of earnings per share. Nevertheless, it is easy to demonstrate that *earnings*, whether expressed in the form of profit margin, earnings per share, percentage return on invested capital ('ROI'), or percentage return on common equity, cannot and do not provide an adequate index to the firm's financial performance.

Briefly, only if earnings were 100 per cent profit – as assumed by *Fortune*, *Business Week*, and most financial analysts – would an increase in the foregoing indices infallibly reflect an improvement in the firm's performance. Of course, if earnings were 100 per cent cost-of-capital, as so many economists insist – and as substantially all textbooks dealing with engineering economy, managerial accounting, and capital management agree – then improved performance of the firm would be indicated by a *reduction* in profit margin, earnings per share, percentage return on invested capital ('ROI'), and percentage return on common equity.

The indisputable fact is that earnings are neither 100 per cent profit nor 100 per cent cost-of-capital. If the firm is not losing money, its earnings represent the sum of its cost-of-capital *plus its Profit Incentive*, thus:

Earnings=Cost-of-capital plus Profit Incentive.

The cost-of-capital component of earnings is desirably *minimised*, like any other cost. It is the company's *Profit Incentive*, desirably *maximised* out of any revenues obtainable, that provides the appropriate index to the firm's performance, whether expressed as a percentage of total invested capital ('PIOI'), as a percentage of the firm's common equity capital, or in terms of Profit Incentive per share. Actual experience of a typical corporation over the past decade will supply an illustration.

Note that the term *Profit Incentive* is capitalised throughout to call attention to its exact definition as here provided, and particularly to distinguish it unmistakably from the familiar expression 'profit margin' (=net income as a percentage of sales). Cost-of-capital is referred to herein as MAR (=Minimum Acceptable Return) for a similar reason, to be explained.

I. Misleading indices to performance: a typical case

Table 1 presents data for an actual corporation over the past ten years, as follows:

(1) Profit margin (=net income as a percentage of sales)

(2) Return (gross income) as a percentage of total invested capital (='ROI')

(3) Return available for common dividends (=net income, adjusted for preferred dividends if any) in per cent of common equity

(4) Earnings per share, dollars per year

(5) Cost of common equity capital (MAR), per cent

(6) Profit Incentive, per cent of common equity capital.

A regulated public utility was chosen for this purpose for several reasons, one being because utilities characteristically find it necessary to seek incremental external capital at frequent intervals in order to finance new plant needed to supply growing loads. It is common knowledge that interest rates on new borrowings soared during the past few years, while market prices per share of common stock plunged downward. Many utilities are finding it necessary in 1971 to issue almost twice as many new shares as in 1966 to raise the same dollars of common equity capital externally.

In this instance, profit margin (=net income as a percentage of revenues) was remarkably stable, rising from 13·43 per cent in 1961 to a high of 14·61 per cent in 1968. The 1970 figure – poorest of the decade – was still more than 88 per cent of the average for the preceding nine years, at 13·29 per cent. This record suggests a very consistent performance, even in the poorest years of 1961 and 1970.

As might be expected for a regulated utility, percentage return (gross income) on total invested capital (='ROI') was also quite stable, ranging from a low of 6·94 per cent in 1962 to a high of 7·40 per cent in 1967, and ending the decade at almost the same figure as at the start: 7·06 per cent versus 7·04 per cent. In only three prior years was the 1970 percentage exceeded.

Percentage return on common equity likewise reached a high in 1967 (13·57 per cent), falling regularly but not drastically thereafter to 12·07 per cent in 1970, which is 89 per cent of the 1967 high.

Behaviour of earnings per share was disappointing in 1968, when the annual increase was only 4c compared to a six-year average in prior years of 15c. Nevertheless, the 1969 figure of $2.62 was high for the decade, and the 1970 figure of $2.46 had been exceeded in only the three preceding years.

Finally, compare these reassuring indices with behaviour of Profit Incentive, in the last column. It gave a clear warning of trouble in 1966 by dropping 37 per cent below the previous year's figure while all other indices were rising. It proceeded to confirm the difficulty in 1967, when all the other indices were at their respective peaks for the period todate. By 1968, true magnitude of the disaster was becoming apparent; in 1970, Profit Incentive almost disappeared.

Such behaviour of Profit Incentive not only reflected current poor and worsening performance of the firm, it also anticipated the cumulative difficulties. Existing stockholders were exposed to a powerful 'disinvestment incentive'; they were willing to part with their stock holdings at low market prices. 'Newcomers' were no longer willing to pay former high prices per share for new issues even if they were to be offered, and the company, for its part, was most reluctant to offer new issues at the low prevailing price per share. All of which increased the company's percentage cost of common equity (MAR) immediately *for every dollar of its common equity*, existing as well as incremental, internally generated or externally obtained, since every dollar of the firm's common equity has one and the same cost at any moment.

Table 1, then, suggests why Profit Incentive – foundation of the Minimum Revenue Requirements Discipline (MRRD) – has been proposed *not to*

TABLE I
Five proposed performance indicators
A decade of one company's experience

Year	*Profit margin (per cent of sales)*	*Return on invested capital ('ROI')*	*Return on common equity capital*	*Earnings per share*	*Cost of common equity (MAR)*	*Profit incentive (per cent of common equity)*
	%	%	%	$	%	%
1961	21·71	7·04	12·48	1.66	9·79	2·69
1962	21·31	6·94	12·76	1.88	10·23	2·53
1963	21·58	6·96	12·67	1.96	9·04	3·63
1964	21.54	6·97	12·76	2.07	9·25	3·51
1965	21·68	7·16	13·11	2.23	9·44	3·67
1966	21·71	7·34	13·42	2.40	11·11	2·31
1967	22·00	7·40	13·57	2.56	11·19	2·38
1968	21·17	7·29	13·15	2.60	11·42	1·73
1969	22·40	7·28	12·19	2.62	11·14	1·05
1970	22·29	7·06	12·07	2.46	12·05	0·03

All data reclassified to conform to the revised Uniform System of Accounts effective 1 January 1970. The reclassification had no effect on net income.

Adjudicated rate base is not involved in any way in calculations of the above data.

supplement but to supplant all other 'success indicators'[3] not only as the only appropriate and dependable index to a firm's relative (year-to-year) and absolute performance, but also for appraising comparative performance of different companies in the same or in different industries. Success indicators based on earnings, whether in the form of profit margin, percentage return on total capital investment ('ROI') percentage return on common equity, or on earnings per share, are unsound in basic principle. None of the latter can be depended on to reveal when 'profits' are decreasing out of increasing earnings as the result of rising cost-of-capital.

A study in contrasts

The literature and teaching of this technology is notably deficient because of this failure to discriminate sharply between earnings (realised, anticipated, target, or 'fair') and cost-of-capital. The Minimum Revenue Requirements Discipline (MRRD) is unique in its insistence upon respect for the principle of Profit Incentive. Recent events supply the material for an interesting study of consequences.

A. Management of the reference company in Table 1 was keenly aware of the 1966 collapse in the firm's Profit Incentive, and was not misled by action of the other indices popularly accepted, taught and acted upon as though they were respectable. By early 1968, studies were under way which demonstrated the need for rate relief if future customers were not to be unduly penalised by reason of undercharges enjoyed by present ratepayers. The decision to file for higher rates was reached in 1969; in December, 1970, the commission granted an interim adjustment, and a final order was expected momentarily at the time this was written.

B. On the other hand, many managements are the trusting victims of an untrustworthy technology. The article 'Profit Forecast; A Jarring Note of Optimism', *Business Week* for 7 March, 1970, provides this illustration.

At that time, the Wharton economic model (University of Pennsylvania) was forecasting a real recession in 1970, with a drop of 8·6 per cent in 'profits'. The Government's Council of Economic Advisers was predicting a drop of 5·6 per cent. But the survey of opinion of businessmen conducted by the McGraw-Hill Economics Department prophesied a *rise* of 6 per cent in corporate earnings! It was said that about half of the companies in the sample, mostly large ones, expected greater 'profit margins' in 1970.

Ramifications of such discrepancies were also noted; for example, such a result was said to pose a worrisome problem for government policymakers then debating whether the time was ripe for the Federal Reserve Board to take steps toward easier monetary supply.

Probable explanation for the disagreement – not mentioned in the article – was that the more sophisticated analyses were able to perceive when 'profit' is disappearing out of rising profit margins and earnings per share, together with sustained percentage earnings. In effect, they must have recognised that earnings are not 100 per cent 'profit', but are made up of *two* components, one of which is desirably *minimised*. When the component desirably minimised behaves otherwise, 'profit' can evaporate out of rising earnings. Misled by the currently-accepted literature and teaching of capital management, managerial accounting, and engineering economy, very few managements outside of the public utility industry appear to be aware of – or at least sensitive to – that simple arithmetic.

II. Incompetent decision models versus MRRD

The foregoing discussion makes it clear that the major obstacle to a competent and authoritative technology is failure to agree on the exact nature and behaviour of the firm's cost-of-capital; in particular, its cost of common equity capital, which is the component of earnings (realised, anticipated, or 'target') that is to be minimised. One might reasonably expect that agreement could be reached without great difficulty on a single precise definition of the intended quantity and its attributes, since the problem lies at the interface of the disciplines of accounting, economics, and finance. Instead, the present situation is one of confusion and controversy. The MAR/MRRD Model, to be explained, is designed specifically to resolve this difficulty with complete conviction.[4]

Because it is the *investor's* decision process that provides the means for comprehending and evaluating the *firm's* MAR on common equity, it is necessary to spell out the stockholder's basic reasoning in meticulous detail. It will be found that this unique process operates to the great benefit of everybody: investors themselves, the enterprise they own, the firm's customers, and the community at large.

Foundation of our free-enterprise capitalistic economy is enlightened self-interest. Profit Incentive is indeed its central feature; but there are two aspects of this situation that appear to be commonly overlooked or misrepresented to its disadvantage.

First, the *amount* of profit is grossly exaggerated by the practice of misrepresenting net income as 'profits'. In a typical case, cost-of-capital perhaps approaches 80 per cent of net income; thus, Profit Incentive may be in the order of *one-fifth* of what is popularly believed.

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[3] Paul H. Jeynes, *Profitability and Economic Choice*, Iowa State University Press, 1968.

[4] Paul H. Jeynes, 'A Discipline for Investment Decisions', *The Accounting Review*, January 1965.

Second, the bankrupt firm is unable to assume any social responsibilities of benefit to the community. If a corporation is to survive, it has a *financial* obligation to meet competition; to supply goods or services that equal or surpass others at the same or lower price. The more successful it is in meeting competition, the greater is its financial reward (Profit Incentive), and the smaller its cost-of-capital. The smaller its cost-of-capital, the better position it is in to meet competition by lowering selling price of its output; and that not only benefits consumers, but retraces the whole cycle. The firm is in better position to afford to recognise its social obligations.

For such underrated reasons, the Profit Incentive motivation is inestimably more persuasive and effective than any civil coercion or moral suasion can hope to be. It accounts for the overwhelming superiority of our economy. Unfortunately, it is dimly understood by those who regard 'profit' as a dirty word.

Still more unfortunately, it is only dimly comprehended by its apologists, as well. Bodenhorn pointed out[1] that there are differences of opinion among economists about the specific earnings stream and the specific discount rate to use in order to solve the capital-budgeting problem. That was a dozen years ago, and the situation has not improved in the interim. The MAR/MRRD Model, to be explained in detail, was designed to resolve that issue convincingly.

The investor's decision model

It is difficult to imagine an investor's purchasing a share of common stock at today's market price if he were certain that:

(1) He would never receive a cash dividend, and

(2) Market price per share would never rise above his purchase price and might fall below it.

The reason: In such case, he would be unable to perceive any Profit Incentive, which is essential to motivate the purchase.

If the firm's net income is insufficient to permit payment of cash dividends, and as a result market price is not sustained and declines without hope of recovering, there is no Profit Incentive for new equity capital suppliers ('newcomers'), who are the potential purchasers of new issues of common shares. As a result, the firm's cost-of-capital suffers (increases); it is less capable of meeting competition successfully, in poorer position to lower price of its output or to meet its social obligations. For whose benefit are the firm's 'profits' still reported by the financial periodicals?[5]

Corporations *offer* new issues of their common shares to investors (capital suppliers); investors decide for themselves whether the proffered securities present a sufficiently attractive investment opportunity to justify their purchase. It is this investor reaction that sets the market price of the stock.

No one can tell exactly how investors will arrive at the price they are willing to pay for any security, even though the experienced analyst may be able to make an accurate estimate of that price. But if the investor's decision-making process is rational, we do have a basis on *a priori* grounds for concluding something about the general nature of his 'decision model'. Primarily, his decision to buy is motivated by his conclusion that the purchase offers an attractive Profit Incentive, defined as before per share:

Investor's Profit Incentive=His Earnings less His Cost.

In this case, his earnings are defined as:

(*a*) Future cash dividend receipts, plus

(*b*) Future capital gains, meaning the increase in market price above purchase price.

And his cost is his initial purchase price.

The vital – and awkward – point is that his earnings consist of *future* receipts; his cost, to be subtracted from earnings, is an *immediate* outlay. Consequently, his Profit Incentive is determinate only if his future earnings can be reduced to their immediate equivalent present worth *to the investor himself* by applying the appropriate discount rate. It will be demonstrated that the appropriate discount rate or 'discount factor' is the *individual investor's* own cost-of-capital. Various writers have confused the facts unnecessarily by asserting that choice of the discount factor is a complex question – which it is not – and by further insisting that the crucial question is whether the discount factor should include an adjustment for risk – which it manifestly should not. There is no room for differences of opinion here, for reasons that will be carefully pointed out. Such misconceptions, when entertained by educators,[6] emphasise the need to spell out at most elementary level the stockholder's reasoning in meticulous detail.

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[5] Conventional practice is to report a 'deficit' when net income is negative. Actually, 'profit' becomes negative when cost of common equity (i.e. MAR on common equity) is greater than net income.

[6] *Report of American Accounting Association Committee on Managerial Decision Models*, 1969.

'The choice of the discount factor is a complex question. suggestions range from the use of a default-free interest rate to a weighted-average cost of capital. The crucial question is whether the discount factor used to compute present value equivalents should include an adjustment for risk.

'Unfortunately, when risk is incorporated into the analysis, the decision rules become more complex.' (Footnote, p. 73).

Ordinarily, the individual investor's own cost-of-capital is an indeterminate percentage. Fortunately, as will be demonstrated, that fact is of no consequence, because it is the investor's *Minimum Attractive Return*, greater than his cost-of-capital by some amount of his Profit Incentive, that is our concern. The investor's Minimum *Attractive* Percentage Return, which is capable of being evaluated with assurance, constitutes *the firm's* cost-of-capital; preferably identified as the firm's *Minimum Acceptable Return* (MAR) for two good reasons. One will be explained later on; the other is to distinguish the concept here presented from numerous (at least ten) proposed definitions of cost-of-capital, all indefensible.[7]

To continue with the investor's course of reasoning, if – by some means or other – the investor appraises the value *to himself* of his future receipts at sufficiently *more* than current market price of the security, he may perhaps decide to buy it. If he were to make a formal calculation for this first step, he would have to do it in two parts:

(1) Decide just what the future receipts are going to be, in amount and timing, and

(2) Convert them into his own equivalent present worth by applying the discount rate.

Having performed this formal arithmetic, he could then subtract current market (purchase) price from the calculated present worth of future receipts to discover his Profit Incentive. It is only then that he must decide, as a separate and distinct consideration, whether the *amount* of his Profit Incentive is sufficient *in his own opinion* to justify his taking the risk involved *as he appraises the risk involved.* Manifestly, this allowance for risk is no part of the present-worth arithmetic; it is a subjective opinion dependent on his own circumstances and his own degree of aversion to risk, which could be expected to differ substantially from one individual to the next for the same stock at the same time. A great deal of misleading conjecture has been introduced as the result of failure to observe or respect these simple facts which assuredly are not accurately described as constituting a 'complex question'.

To summarise, if the individual investor's own estimate of his Profit Incentive (arrived at in *any* manner) is sufficient to justify his accepting the associated risk *in his own opinion*, and if he sees no more attractive investment opportunity available elsewhere, then purchase of the security is warranted *in his own judgement*. This is, the same anticipated future receipts, coupled with a different investor's cost-of-capital and/or different subjective appraisal of the risk involved, or even knowledge of a more attractive opportunity elsewhere, could influence another investor to *sell* the same security at the same time at the same market price. For this reason, it is only the willing *purchasers* of a new issue of the firm's stock (i.e. newcomers) to whom we look for evaluation of the firm's cost-of-capital. It is curious indeed how commonly this essential ingredient of the reasoning is overlooked.

Note also that so-called 'opportunity cost' enters only as one part of the evaluation of *relative* attractiveness, apart from the present-worth arithmetic. Since attractiveness of any competing opportunity must also be evaluated by looking into both the amount of Profit Incentive offered and related risk, identifying 'opportunity cost' as the controlling influence in establishing the firm's cost-of-capital is no more than unhelpful tautology.

In reality, probably few if any investors take the trouble to attempt the formal present-worth calculations. For one thing, the calculated present worth depends on the period of future ownership of the stock, and that is ordinarily indeterminate. Few investors have definite plans on that score at time of purchase; they simply expect to hold the security until some reason arises to sell it advantageously. Because the analyst cannot know investor's cost-of-capital (the discount rate) nor the anticipated period of ownership, nor how much Profit Incentive is necessary to motivate the decision to buy, he can only speculate about them; and that is what some writers have done to no useful purpose.

Such pointless speculation is no part of the MAR approach, which is *not a theory* but a disciplined system of measurement. The investor's decision model will be found to provide the means for evaluating the firm's cost-of-capital without relying on any theory, and despite what may appear to be insoluble difficulties as just described. A simple example will illustrate how it is done.

An illustrative example

For simplicity, this example will confine the analysis to a three-year period of ownership of a security, which could be a share of common stock or a fixed-income investment (a bond). For purposes of establishing the firm's MAR on common equity, the stock is of primary interest; the situation for the bond is included for a special reason to be explained.

In either case, current market price is assumed to be $75 which is also the face value of the bond. Market price of the stock is assumed to increase regularly at the rate of 5·8 per cent annually, while the cash dividend rate is 3·2 per cent of the first-of-year market price in each year. Thus, the investor's annual earnings from ownership of the stock is a constant 9 per cent of first-of-year market price in every year. Of course, increase in market price does not contribute to *cash* flow except when the stock is sold; accordingly, stockholder's annual receipts will be shown in two ways:

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[7] Reference 3, *supra*, p. 10.

(1) Annual contributions to his present worth, and

(2) Annual cash flow.

Part B, for the bond, assumes annual interest receipts at 9 per cent of the *constant* market price of $75, amounting to $6.75 at each year end. In the final year only, when the bond matures, a single additional cash flow of $75 is realised.

Note that if the stock were never sold, but dividends continued forever (a special case of Part A–2), we would have the unique situation envisioned by the Discounted Cash Flow Theory (DCF). We will return to this subject.

So much for the assumed conditions of our example. Any other assumptions would serve as well, as to the common first cost (initial market price), the initial dividend rate and its rate of increase, the rate of increase in market price of the stock, and interest rate on the bond. Any other term of ownership would also serve our purpose.

Table III

Table III introduces the application of present-worth theory to the data of Table II.

If a discount rate of 9 per cent is applied to the investor's annual receipts for the three-year period, it will be found that, at the date of initial purchase, present worth of investor's future receipts amounts to exactly $75 (=initial purchase price) in all three cases. This should be no surprise.

In A–1, the combination of growing dividend payments plus increase in market price amounts to 9 per cent of first-of-year market price in each year. Thus, the investor realises 9 per cent receipts *currently*, and gets back his initial investment at the end of the period. The result is a 9 per cent level annuity. Present worth of the annuity equals initial cost.

In A–2, the situation differs in that *at the end of the period* the investor gets back his initial investment ($75) *plus 9 per cent compounded annually*, in addition to the regular annual dividends in the interim. It is just another version of a 9 per cent annuity, present worth of which is initial cost, when discounted at 9 per cent.

The bond provides still another variety of 9 per cent annuity. It pays a *constant* annual interest of 9 per cent, and returns the initial investment at the end of the period.

TABLE II

Details of two securities yielding a 9% return to Investors, per Table III

A. THE COMMON STOCK

1. Annual contributions to Investor's present worth

Year	*Market Price (first of year)* $	*Market Appreciation* $	*Dividend (end of year)* $	*Total contributions* $
1	75.00	4.35	2.40	6.75
2	79.35	4.60	2.54	7.14
3	83.95	4.87	2.69	82.56
4	88.82	—	—	—

2. Annual cash flow

Year	*Market price (first of year)* $	*Dividend (end of year)* $	*Cash flow* $
1	75.00	2.40	2.40
2	79.35	2.54	2.54
3	83.95	2.69	91.51
4	88.82	—	—

B. THE BOND

Year	*Interest (end of year)* $	*Recovery at maturity* $	*Cash flow* $
1	6.75	—	6.75
2	6.75	—	6.75
3	6.75	75.00	81.75

TABLE III

Present worth of investor's returns discounted at 9% MAR

A. THE COMMON STOCK OF TABLE II

1. Annual contributions to investor's present worth

Year	*Present worth factors*	*Present worth*
		$
1	$1/1{\cdot}09$	$(2.40+79.35)/1{\cdot}09=75.00$
2	$1/(1.09)^2$	$2.40/1.09+(2.54+83.95)/(1{\cdot}09)^2=75.00$
3	$1/(1{\cdot}09)^3$	$2.40/1.09+2.54/(1{\cdot}09)^2+(2.69+88.82)/(1{\cdot}09)^3=75.00$

2. Annual cash flow

Year	*Present worth factors*	*Cash flow*	*Present worth*
		$	$
1	$1/1{\cdot}09$	2.40	2.20
2	$1/(1{\cdot}09)^2$	2.54	2.14
3	$1/(1{\cdot}09)^3$	91.51	70.66
		Total present worth	75.00

B. THE BOND OF TABLE II

Year	*Present worth factors*	*cash flow*	*Present worth*
		$	$
1	$1/1{\cdot}09$	6.75	6.19
2	$1/(1{\cdot}09)^2$	6.75	5.68
3	$1/(1{\cdot}09)^3$	81.75	63.13
		Total present worth	75.00

The same situation will be discovered for *any* period of ownership: present worth of an i per cent-annuity, *when discounted at i per cent*, is equal to the initial cost, by definition of terms.

Suppose, in Part A–2, that the period of ownership were infinite; that the growing dividends continue forever. Present worth of the non-existent terminal receipts would then be zero, and present worth of the *perpetual dividend receipts only* would constitute total present worth of the investment. Even by Year 100, present worth of the terminal payment, discounted at 9 per cent, would be 1/5529 of that final year's cash flow.

In other words, if the stock is never sold, the present-worth calculation of Part A–2 duplicates the calculation for Part A–1. In either case, total present worth then equals present worth of dividends only in perpetuity; and it is $75 in either case.

That is the heart of the Discounted Cash Flow Theory. The usual laboured demonstration that $k=D_0/P_0+g$ is an example of needless confusion.

As noted before, the investor's cost-of-capital is ordinarily indeterminate. But suppose it were known to be 9 per cent. This would be the case, for instance, if his only source of funds for purchase of the stock or bond of Table II were the sale of an identical security he already owns – the same 9 per cent receipts on the same market price of $75, and even the same risk.

What motivation would there then be for the purchase?

There would be zero *Profit Incentive*; the investor would give up an income of 9 per cent of $75 in exchange for an income of the same 9 per cent of $75, with no capital gain and no change in risk! There would be no point in the purchase. True, the investor *would not lose* by making the exchange. This is the explanation, promised earlier, for identifying this 9 per cent cash flow as investor's *MAR* (Minimum *Acceptable* Return). It is just equal to his cost-of-capital, and therefore not an *attractive* return. His Minimum *Attractive* Return is necessarily greater than his cost-of-capital by some amount of *Profit Incentive*.

Our purpose is to demonstrate that the firm's cost of common equity is the 'newcomer' investor's Minimum *Attractive* Return; further, that Investor's Minimum *Attractive* Return can be observed currently, without any knowledge of investor's cost-of-capital, and without resorting to present-worth theory or calculations. Table III sets the stage for that demonstration.

Table IV

Suppose the investor's cost-of-capital, in this instance, is not 9 per cent but only 5 per cent. Perhaps he owns a security having the same risk as those of

TABLE IV

Present worth of investor's returns discounted at investor's cost of capital (5%)

A. THE COMMON STOCK OF TABLE II

1. Annual contributions to investor's present worth

Year	*Present worth factors*	*Present worth* $
1	$1/(1\cdot05)$	$(2.40+79.35)/1\cdot05=77.86$
2	$1/(1\cdot05)^2$	$2.40/1.05+(2.54+83.95)/(1\cdot05)^2=80.74$
3	$1/(1\cdot05)^3$	$2.40/1.05+2.54/(1\cdot05)^2+(2.69+88.82)/(1\cdot05)^3=83.64$

2. Annual cash flow

Year	*Present worth factors*	*Cash flow* $	*Present worth* $
1	$1/1\cdot05$	2.40	2.29
2	$1/(1\cdot05)^2$	2.54	2.30
3	$1/(1\cdot05)^3$	91.51	79.05
		Total present worth	83.64

B. THE BOND OF TABLE II

Present worth of Profit Incentive=83.64−75.00=$8.64

Year	*Present worth factors*	*Cash flow* $	*Present worth* $
1	$1/1\cdot05$	6.75	6.43
2	$1/(1\cdot05)^2$	6.75	6.12
3	$1/(1\cdot05)^3$	81.75	70.61
		Total present worth	83.16

Present worth of Profit Incentive=83.16—75.00=$8.16.

Note: Table IV explains why stock market prices tend to rise when money is more plentiful (i.e., when investors can borrow at lower rates), even though corporate earnings are not increasing – or even may be falling, as in early 1971.

Table II which pays only 5 per cent on its current market price, which he is willing to sell to raise funds for the purchase.

Table IV shows his calculations of total present worth of receipts from the security of Table II if discounted at his cost-of-capital rate of 5 per cent.

The stock has a present worth of $83.64, whether calculated in the manner of A–1 or A–2.

The bond now has a present worth of only $83.16.

In either case, the purchase offers a *Profit Incentive.* The investor must now decide whether that Profit Incentive is enough to induce him to make the purchase. Perhaps he will decide that he would be willing to buy even if the Profit Incentive were smaller; but, being a prudent individual, he will not offer to pay more than is necessary.

Observe that the DCF calculation (setting present worth of perpetual dividends equal to current market price, and solving for discount rate k) is no longer useful. It would still produce $k=9$ per cent, as in Table III – *i.e. the situation when Profit Incentive is zero.*

Note also that Table IV explains why stock market prices tend to rise when money is more plentiful (i.e. as when bank discount rates fall, and investors can borrow at lower cost-of-capital) even though corporate earnings are not increasing, as happened in early 1971. That is, the same future receipts – when discounted at a *lower* percentage cost-of-capital – produce a *greater* equivalent present worth, which means a *larger* Profit Incentive for the same market price. Or, alternatively stated, a willingness to pay a *higher* market price to obtain *the same* Profit Incentive.

There remains one highly important comment on results of Table IV in connection with behaviour of Profit Incentives which motivate stock (or bond) purchases. It deals with a phenomenon well recognised by investors, but seemingly overlooked in most theories of investment in the firm.

Table IV–A shows the behaviour of future receipts that today's investor has more or less vaguely or intuitively in mind when he buys a security. The data of Table IV are here projected into the future for several years (years 10, 15, 20, 25, 30, 35 and 40) as follows:

Column 1: Dividend for the current year (d)

Column 2: Increase in market price for the current year (x per cent of P)

Column 3: Total receipts in the current year (d+x per cent of P, as in Table II)

Column 4: Total receipts in the current year as a percentage of initial purchase price of $75.

TABLE IVA

The Year 1 newcomer's earnings in future years

(Purchase price $75.00)

Year	Annual dividend per share	Annua increase in market price	Total receipts per share	Per cent of $75.00
	$	$	$	
3	2.69	4.87	7.56	10.09
10	3.99	7.23	11.22	16.25
15	5.29	9.58	14.87	19.80
20	7.00	12.69	19.69	26.20
25	9.29	16.82	26.11	34.80
30	12.31	22.31	34.62	46.20
35	16.32	29.60	46.92	62.50
40	21.64	39.22	60.86	81.20

Note: The Year 40 newcomer still has initial annual earnings (= MAR) of 60·86/676·09=9·00%.

Percentages in Column 4 may be compared with investor's cost-of-capital (here 5 per cent) to discover the amounts of Profit Incentive that go to motivate investment in Common shares. Observe that the quantity d+x per cent of P as a percentage of market price *at the beginning of each year* remains a constant 9 per cent. Thus, the initial amount of Profit Incentive for 'newcomer' purchasers in each successive year remains a constant 4 per cent (=9–5), if investor's cost-of-capital is a constant 5 per cent.

Table IV–B shows present worths of these future receipts for the same extended periods. Alternatively, these present worths might be compared with investor's initial investment of $75 to discover the amounts of Profit Incentive that go to motivate investment in common shares.

TABLE IVB

Cost-of-capital: The accounting solution

Present worth of investors' return

Discounted at investor's cost of capital (5%)

For terminal dates at end of years 3–40

Terminal date End of year	*Present worth of future returns For the stock*	*For the bond*
	$	$
3	83.64	83.16
10	104.57	98.17
15	120.22	106.14
20	136.47	112.39
25	153.36	117.28
30	170.89	121.12
35	189.10	124.12
40	208.02	126.48

Market price of the stock initially, $75; increasing 5.8% annually. Annual cash dividend at end of year $2.40 initially, equal to 3.2% of market price at beginning of each year.

Initial price of bond (face value) $75; annual interest $6.75 (9%) at end of each year.

In brief, *there is no special merit in the present-worth comparison of receipts* with purchase price of the security. Comparing *current* rate of receipts with *current* cost-of-capital – i.e. looking to *current* rate of Profit Incentive – serves the same purpose better. This is the reason why few, if any, actual investors take the trouble to make the formal and unnecessary present-worth calculations; particularly, why investors are scornful of the DCF approach. It is not only unrealistic and laborious, but totally unnecessary.

And that observation serves to introduce the MAR/MRRD model, which is our major objective.

Table V: The MAR/MRRD model

It was pointed out before (page 167) that we must look to 'newcomers' (i.e. willing purchasers of a new issue of the firm's common shares, if offered) for evaluation of *the firm's* cost-of-capital. Whatever the firm's earnings per share may be, they must be sufficient to induce newcomers to purchase new issues; they must be sufficient to induce newcomers to purchase at an existing market price such that the initial rate of annual receipts to the purchaser will be

$$\left[\frac{d+x\% \text{ of } P,}{P}\right]$$

equal to *investor's* current Minimum *Attractive* Return. Any lower rate of company earnings, establishing a lower market price and therefore *greater* rate of

$$\left[\frac{d+x\% \text{ of } P,}{P}\right]$$

will be insufficient to sell new shares at the same P dollars per share. This is just arithmetic; no 'theory of investment' is involved beyond the normal expectation that smaller earnings are normally reflected in a lower market price. Temporary abnormal departures from this general rule have been recognised and discussed elsewhere.[8] Hence, the *investor's* current Minimum *Attractive* Return, readily estimated from currently reported data, is the *firm's* MAR (Minimum *Acceptable* Return) – the preferred definition of *the firm's cost of common equity* for two reasons mentioned before (page 168):

(1) To distinguish it from all other proposed evaluations of cost-of-capital, and

(2) Because incremental projects made by the firm would not lose money *provided the firm's MAR were not increased as a result*, although they would provide zero Profit Incentive. However, *incremental earnings providing zero Profit Incentive are insufficient to sell incremental shares at a price sufficient to maintain existing MAR.*

The transcendent importance of recognising Profit

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[8] Ibid, p. 68.

Incentive *in an amount demanded by capital-suppliers* can now be appreciated. It is puzzling indeed that the significance of Profit Incentive, as here exactly defined, is so often overlooked or ignored. Obviously, it is fatal to confuse the company's *earnings* with its cost-of-capital, as so many do.

There are three important elements in the motivation which enables a firm to pay constantly increasing dividends per share while earning the same fixed percentage of invested capital; which enable it to obtain new capital funds at a cost below its current rate of return. These inducements are among the most remarkable features of our inadequately appreciated free-enterprise system, which has been much maligned by many for failing to act as a responsible allocator of resources:

1. The amount of company earnings available to pay common dividends depends on the current amount of *Profit Incentive* earned, *not* on the percentage return earned. To illustrate, for MAR at 9 per cent:

Project A: Capital investment $100,000; earnings 25 per cent.

Project B: Capital investment $200,000; earnings only 20 per cent.

Number of common shares outstanding=100,000.

Consider the Profit Incentives (=Earnings less MAR):

Project A:
100,000 (25—9 per cent)=$16,000 per year
=16c per share

Project B:
200,000 (20—9 per cent)=$22,000 per year
=22c per share

Project B makes a *greater* addition to earnings per share than Project A, despite its smaller *percentage* earnings.

2. When the company is earning a Profit Incentive, it can be expected that the *investor's* annual receipts per share will *exceed the company's earnings* per share in the same year. This arithmetic is encountered whenever market price exceeds book value of common equity, per share.

See Table V for the situation for the stock of the preceding tables. Newcomer's annual receipts amount to $6.75 per share, although the company is earning only $5 per share.

It is this motivation, producing a low cost-of-capital and its attendant advantages to consumers, which some theorists have proposed eliminating – to the disadvantage of all – by limiting utility revenues to the amount which would eliminate Profit Incentive! The result would inevitably be to favour current rate payers at undue cost to future consumers.

3. Outstanding ('pre-project') common shares, purchased at prices P_0 below current market price P –

TABLE V
The MAR/MRRD MODEL
(An example)

Book value of common equity (B)=$50.00 per share
Current market price (P)=$75.00 per share
Earnings per share (3)=$5.00 per share per year
Dividend rate (d)=$2.40 per share per year
Current rate of increase in P (=x% of P)=5·8%, or $4.35 per share

$$\text{MAR on common equity}=\frac{d+x\%\text{of }P}{P}=\frac{2{\cdot}40+4{\cdot}35}{75}=\frac{6{\cdot}75}{75}=9{\cdot}00\%$$

	Earnings=cost of capital+Profit Incentive	
I. *The company's view*		
% of book value:	10·00%=9·00%	+1·00%
$/share:	5·00 =$4.50*	+$0.50†
* 9.00% of 50%. † By difference.		
II. *Newcomer's view (if his cost of capital is 5%)*		
% of purchase price:	9·00%*=5·00%	+4·00%
*'Earnings'=MAR at 9·00% of $75		
	$6.75†=$0.75‡	+$3.00
† $2.40+$4·35. ‡5% of $75.		

Inducements to invest

1. *The firm's Profit Incentive:* earnings exceed its cost of capital (MAR) by 50% per share.
2. *Investors' inducements:*
   (*a*) 'Earnings' (=MAR) exceed his cost of capital by $3.00 per share.
   (*b*) Newcomers become 'pre-project' shareholders at the next addition to common equity, and 'earnings' can then be expected to increase.

For example, average issue/purchase price per outstanding (pre-project) share are here less than $50 per share (i.e., book value of $50 includes retained earnings). Say $35·00 per share. Then the 'average' pro-project share is now earning 6.75/35=19·25% on initial issue/purchase price.

earn the same current dividend *per share* and enjoy the same market price (hence the same x per cent of P) *per share* as incremental shares. But having been purchased at lower price per share, they enjoy tremendously greater return on initial *issue/purchase* price. See Table IVA.

Table V will be self-explanatory. The newcomer's Minimum *Attractive* Return, which is the company's cost-of-capital (MAR), is here currently 9 per cent, as in Table III.

Company earnings, at 10 per cent of book value, are $5 per share, providing a company Profit Incentive of 1·00 per cent of book value, or 50c *per share.*

Newcomer's current annual receipts are that same 9 per cent of his purchase price ($75), giving him a 4 *per cent* Profit Incentive (as in Table III), or $3 *per share.* And he expects these benefits to increase with passage of time, even though the company continues to earn the same constant *percentage* return on common equity.

Table V describes the only basis for sound managerial decision processes.

The sound decision model

Thus far we have discussed the investor's Profit Incentive and the firm's Profit Incentive and their functions; the MAR/MRRD model of Table V calls attention to the *individual project's* Profit Incentive. The analytical technique identified as MRRD (Minimum Revenue Requirements Discipline) is the only one that recognises the project's Profit Incentive – exactly defined as below – as the only appropriate and exactly-intended index to profitability of any corporate investment proposal. Project Profit Incentive, net, is the difference – after deducting taxes on Profit Incentive itself – between:

(*a*) Revenues brought in by the project (realised, anticipated, or 'target'), and

(*b*) Costs of the project, including cost of the capital funds invested in the project (=MAR on the capital investment).

Because a portion of the firm's total tax obligation is related to Profit Incentive itself – realistically recognising that a *portion* of taxable income is 'profit' – income taxes included in project *costs* represent only that part of the tax levied on MAR. It is sometimes important to observe this distinction. The appropriate 'interest' rate for use in all discounting, present-worthing, or annuitising calculations is also MAR.

Investment decisions made by use of the MRRD technique will maximise earnings *per share* out of *any* stipulated revenues. Conversely stated, they will minimise revenue requirements (i.e. selling prices of the firm's output) necessary to produce *any* stipulated earnings *per share*, thus optimising the firm's competitive position if necessary or desired. Hence the phrase *Minimum Revenue Requirements.*

Decisions reached in any other manner which fail to recognise exact nature of MAR and allow for it, *always* are based on a misrepresentation of project profitability. Even if, by lucky coincidence, other methods select the same alternative from a group of competing proposals, the degree of superiority of the project chosen will be misrepresented.[9]

It will be seen that the MRRD model confirms the previous conclusion that *percentage* return ('ROI') is not a dependable index to profitability. *Provided MAR is constant* (i.e. before and after adopting a proposal; or whichever competing alternative is selected) earnings *per share* is an acceptable index to project profitability (see Projects A and B, page 173), and the MRRD technique makes use of this fact in a unique way, as follows.

The MRRD analysis starts by *hypothesising* (*not* firmly predicting) a constant percentage MAR. However, it can normally be expected, if all else remains the same, that adopting the superior proposal or a profitable new venture that produces an attractive Profit Incentive, that the firm's Profit Incentive per share will increase and its MAR will tend to *decrease.* Accordingly, adoption of such proposals tends to reduce the initially-hypothesised MAR, and thus tends to produce a greater Profit Incentive than revealed by the initial calculation.

Unless the incremental investment is a very large fraction of the firm's total capital commitment, this favourable effect on MAR is usually too small to justify a recalculation; the point is that such recalculation would tend to reveal a 'plus' further confirming the decision. No technique other than MRRD can provide that reassurance.

For such reasons, no analytical approach that omits formal allowances for MAR can possibly qualify as competent. The elaborate 'proofs' sometimes presented, said to demonstrate that 'the preent worth index and its equivalents are correct' – all in absence of any consideration for recognition of MAR – supply a poignant illustration of this shortcoming.[10]

The MRRD approach also demonstrates a serious fallacy that is widely accepted as though it were axiomatic. This unsound proposition is usually stated more or less as follows:

> The company should make incremental capital investments on a descending scale of profitability, raising incremental capital as necessary at in-

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[9] Ibid, particularly Chapters 4 and 11.

[10] For example: Richard H. Bernhard, 'A Comprehensive Comparison and Critique of Discounting Indices Proposed for Capital Investment Evaluation', *The Engineering Economist*, Vol. 16, No. 3, Spring 1971.

creasing cost-of-capital, to the point where cost-of-capital rises to equal the falling rate of incremental earnings. The optimum level of investment is attained when the two rates are exactly equal to each other.

(Often it is added:

– and to the earning power of incremental investment outside of the firm.)

The analysis of Table III (pages 169–170) provides the explanation of this dangerous fallacy. In brief, *no individual, no firm can justify obtaining new funds at a cost of i per cent in order to invest them where they will earn only that same i per cent.* There must be a substantial margin of Profit Incentive; enough Profit Incentive to provide the inducement to invest in view of the degree of risk involved. MAR *plus* this adequate Profit Incentive is the figure popularly known as the *cutoff rate* – that is, the smallest amount of prospective earnings necessary to justify the investment. Widespread uncritical acceptance of the foregoing fallacy as though it were 'classical theory' as often claimed, is one more indication of the inadequacy of the literature, teaching, and practice of this technology.

Such are some of the outstanding features of the sound managerial decision model that is MAR/MRRD.

Estimates of MAR

Determinations of Profit Incentive rest on estimates of *current* MAR. Estimates of MAR over specified periods of time, as needed for purposes of managerial decisions or for regulation of public utilities, are to be developed by projecting a series of 'one-shot' observations of *current* rates of MAR at intervals over a term of years. This approach does not attempt a direct estimate of the average or annuitised percentage over an indefinitely long period, as in the meretricious DCF procedure.

In the present article, attention has been focused on the firm's MAR *on common equity*; but for most applications of MRRD, the firm's *pool* MAR is appropriate and preferred.[11] Pool MAR includes a properly weighted proportion of the cost of capital obtained by borrowing and by issuing preferred stock (if any) along with MAR on common equity.

Omitting consideration for minor details in interests of simplicity, current cost of outstanding debt is represented by current interest obligations of the firm; cost of preferred-stock capital by current preferred-stock dividend obligations. These are to be combined with the cost of common equity in the manner of Table VI to find the firm's pool MAR percentage. Weighting percentages represent the relative contributions of each class of capital to the firm's total capitalisation as shown by the books of account. Even this seemingly obvious purpose has been found capable of being misunderstood.[12]

TABLE VI
MAR on the pool of capital
An Example

50% debt on 5% interest	2·50%
10% preferred stock at 6% dividend	0·60%
40% common equity at 9% MAR	3·60%
MAR on the corporate pool of capital	6·70%

All of the company's projects are financed from its pool of available capital; earnings of all projects contribute to the pool of company earnings, and all interest and dividend payments are made from that pool. For example, an exceptionally profitable project does not pay correspondingly greater interest percentage on the particular debt issues said to finance it, and every outstanding share of common stock pays one and the same dividend rate regardless of profitability of the project it may have been issued to finance. Similarly, there is no reduction in interest rates nor dividend rates on the particular issues made to finance an unprofitable project. Thus, cost-of-capital is one and the same percentage for every project, every department, every line of product or every class of service of the company, at any moment. This fact is frequently overlooked – even denied – by those who confuse *earnings* with *cost-of-capital.*

As defined before, and as shown in Table V:

$$\left[\text{MAR on common equity} = \frac{d + x\% \text{ of } P}{P}\right]$$

where

d=current dividend rate, dollars per share per year

P=current net amount obtainable per share of a new issue of common stock, if offered

$x\%$=current annual rate of increase in P.

Dividend rate (d) can be directly observed; quantity P nearly so, being derived from market price per share at the moment; but x per cent must be inferred from behaviour of P in the recent past and near future. In Utopia, that would present no problem, because x per cent would always be a positive figure as P trended upward regularly. In actual experience, market price is subject to small random variations from time to time, even in the absence of reported changes in company earnings, current or anticipated. When the firm's common stock exhibits a declining market price, careful reasoning is called for in the evaluation of probable x per cent. A great deal of research has been done on the subject of estimating x per cent under such circumstances, but very little has been published.

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[11] It is possible, though awkward on several counts, to use MAR on common equity to accomplish the same objective. See reference 3, *supra*, pp.497–99. Also, with reservations, reference 1(*c*), *supra.*

[12] Reference 2(*a*), *supra*: 'For given mixtures of debt and equity capital there is agreement that the overall cost of capital is equal to the weighted average of the component costs, with the *market* values of the components used as weights.'

No company wishes to offer new issues when market price is unduly low, or expected to fall; that is obviously not the way to minimise MAR. However, so long as the stock is traded on the Stock Exchange, for every seller there must be a buyer; we continue to look to *buyers* for the estimate of current MAR. What motivates purchases of stock in a falling market?

The answer is not particularly obscure nor complex, though details do lie beyond the scope of the present paper. In brief, buyers must not expect the price to fall further; they must expect the depressed price to be temporary or they would postpone the purchase in order to buy the same stock tomorrow at lower price. If the low price is indeed a temporary phenomenon, to be followed by a return to the previous 'normal', it suggests a temporary x per cent *above* the normal rate. The combination of a sustained dividend rate, plus x per cent at the normal rate or slightly greater, both divided by the current low value of P, results in an estimate of MAR *above* normal. And that describes the normal expectation; that is, when the firm's financial prospects look gloomy temporarily, one would expect its cost-of-capital to *rise*; new funds are not so readily obtained.

With the help of a plot of behaviour of per cent return on common equity, MAR, and hence Profit Incentive, with changes in the ratio of market price to book value of common equity, estimates of x per cent and MAR under the most awkward conditions can be made with considerable assurance.[13]

Conclusion

The *investor's* Profit Incentive, which induces him to buy a share of common stock, is the difference between purchase price of the security and the present value to him of the future earnings per share that he foresees (=cash dividends plus increase in market price). He will purchase the stock only if it offers an attractive amount of Profit Incentive, in his own estimation.

The company issuing the stock has a similar decision model which motivates it to obtain capital funds from investors and to purchase productive assets with the money so obtained. The *firm's* earnings from such assets must exceed the *firm's* cost-of-capital by an amount of Profit Incentive sufficient to motivate the transaction.

The investor's minimum *attractive* return from purchase of the stock can be estimated with assurance; it equals:

$$\left[\text{MAR}=\frac{d+x\%\text{ of }P}{P}\right]$$

as described herein. MAR also represents *the firm's* cost-of-capital, less than the firm's *earnings* by the amount of the firm's Profit Incentive.

In brief, the *company's* minimum *attractive* earnings equal the *investor's* minimum *attractive* return plus the *company's* Profit Incentive.

A thorough comprehension of this special system of inducements to invest explains the tremendous success of the free-enterprise capitalist economy. Unfortunately, its functioning and contributions are poorly understood bv its practitioners and teachers. The exact nature of Profit Incentive, foundation of the whole concept, its nature and significance, are commonly ignored and/or misrepresented.

Among the unfortunate and unnecessary effects of this situation are the gross exaggeration of corporate 'profits', widespread use of indefensible indices to company performance, unsound business decisions attributable to acceptance of unsound 'success indicators', and the familiar phenomenon of 'regulatory lag' in the public utility industry.

Until this situation is corrected, two unwelcome and avoidable phenomena will continue to persist:

(1) Prices for goods and services will remain higher than need be to produce *any* stipulated earnings per share, with related dividends and market price of common shares.

(2) Earnings per share, with related dividends and market price of common shares, will remain lower than need be out of *any* stipulated corporate sales and revenues.

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[13] Bert J. Blewitt, *et al.*, 'BenchMARk for Profitability', *The Engineering Economist*, Vol. 15, No. 2, Winter 1970.

Highly recommended report of the Profitability Committee, Metropolitan New York Section of the American Association of Cost Engineers, presented at their 12th National Meeting, Houston, Texas, June 1968.

Markov Chain Models for Motor Insurance

Robert Croasdale

Summary

An introductory account of Markov Chain Theory* is interwoven with a discussion of how under certain conditions the theory can be used in the study of motor insurance policies which offer no-claim discounts.

Introduction

Many British motorists have comprehensive car insurance policies offering a discount or 'no-claim bonus' on terms such as the following:

Consecutive years without a claim	*Discount as % of whole premium*
1	30
2	40
3	50
4	60

The policyholder will revert to payment of the whole premium in the event of a single claim after one or two years claim-free. He will revert to 30%/40% discount if a single claim is made or arises in the year following the allowance of a discount of 50%/60% then, assuming the company agrees and continues insurance at the next subsequent renewal date, entitlement to discount will apply as if there had been one year/two years free of claims.

Now the chance that a given policyholder will have an accident is a complicated function of numerous factors such as his health, the driving habits of himself and others, weather conditions, traffic volume, vehicle speeds and degrees of roadworthiness. In the rather unlikely event that (*a*) such factors act so that the chances remain the same every year that any policyholder will have a claim-free year and if (*b*) the terms of the policy allow for the annual premium to be determined solely by the man's premium and claims record for the previous year, then the conditions are favourable for studying the operation of that policy as a Markov chain.

Markov chains

A Markov chain describes a system which can be in one of a number of states. Transitions from one state to another can take place at fixed times and the probabilities of transitions between given states depend on the current state of the system and not directly on its previous history. We shall consider such systems for which transition probabilities are independent of time, i.e. homogeneous Markov chains.

A 2-state Markov chain

Let us consider a homogeneous Markov chain with 2 states, state 1 and state 2 and let p_{12} denote the probability that an individual member of a system will be in state 2 at time n+1 given that the individual is in state 1 at time n. We may note that for a Markov chain no knowledge of the states of the individual at times n−1, n−2, . . ., etc. is needed in order to express the transition probabilities for time n. We define p_{11}, p_{21} and p_{22} similarly.

It is usual to arrange these probabilities in the form of a matrix thus

$$\mathbf{P} = \begin{array}{c|c} & \text{Next state} \\ \text{Present State} & \begin{array}{ccc} & 1 & 2 \\ 1 & p_{11} & p_{12} \\ 2 & p_{21} & p_{22} \end{array} \end{array} .$$

with the convention that rows refer to 'original' states and the columns to 'final' states.

This belongs to a family of matrices known as stochastic matrices, which have the property that the sum of the elements of any row is unity.

If, at time n, the system consisted of a proportion $f_1^{(n)}$ of individuals in state 1 and the remainder $f_2^{(n)} = 1 - f_1^{(n)}$ in state 2, then the expected proportion of individuals in state 1 at time n+1 would be given by:

(Proportion in state 1 at time n)×(Probability of being in state 1 at time n+1 given in state 1 at time n)
+(Proportion in state 2 at time n)×(Probability of being in state 1 at time n+1 given in state 2 at time n)

or, symbolically

$$f_1^{(n+1)} = f_1^{(n)} p_{11} + f_2^{(n)} p_{21} \quad \ldots\ldots\ldots\ldots \quad (1)$$

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* For more advanced theory see Feller, W., *An Introduction to Probability Theory and its Applications,* Vol. 1 (Third Edition), New York. Wiley (1968).

and, in the same way,

$$f_2^{(n+1)}=f_1^{(n)}\,p_{12}+f_2^{(n)}\,p_{22} \quad \ldots\ldots\ldots\ldots (2)$$

If we introduce a row vector whose elements are the proportions of the population in the different states at time n (the 'state vector' for time n), say $\mathbf{f}^{(n)}=(f_1^{(n)}, f_2^{(n)})$ then we can write equations (1) and (2) in matrix form

$$\mathbf{f}^{(n+1)}=\mathbf{f}^{(n)}.\,\mathbf{P} \quad \ldots\ldots\ldots\ldots (3)$$

the dot denoting matrix multiplication (see Ayres (1962) Chapter 1). The equations contained in (3) are known as the Chapman-Kolmogorov Equations for the system. Just as we have derived equation (3) which expresses the proportions in the different states at time n+1 in terms of

(i) the corresponding proportions at time n, and

(ii) the transition matrix **P** (which is independent of time),

so we can express the corresponding state vector for time n in terms of the state vector for time n−1 and **P**.

Thus $\mathbf{f}^{(n)}=\mathbf{f}^{(n-1)}.\,\mathbf{P}$ . . . . (4)

Similarly $\mathbf{f}^{(n-1)}=\mathbf{f}^{(n-2)}.\,\mathbf{P}$ . . . . (5)

By using (4) repeatedly for different values of n, we obtain

$$\begin{aligned}\mathbf{f}^{(n)}&=\mathbf{f}^{(n-2)}.\,\mathbf{P}^2\\&=\mathbf{f}^{(n-k)}.\,\mathbf{P}^k\\&=\mathbf{f}^{(0)}.\,\mathbf{P}^n \quad \ldots\ldots\ldots\ldots (6)\end{aligned}$$

where $\mathbf{f}^{(0)}$ is the initial state vector, i.e. the vector composed of the proportions in the respective states at time 0.

The computation of successive powers of **P** for use as in equation (6) is often facilitated by spectral decomposition of the matrix (see Ayres (1962) Chapter 21).

A motor insurance policy with one level of discount

Consider a simplified car insurance policy which offers the following discount terms:

> 'The policyholder will pay a premium of £Y p.a. in the first year. If he has no claim during that year he will be allowed a 20% discount in the second year. If there is at least one claim in the first year he will continue to pay the full premium in the second year. If there is no claim then in the second year he will be allowed a 20% discount. The discount rate continues until there is a claim, whereupon he reverts to the full premium in the following year.'

The policy can thus be in one of two states only:

State 1. Pays full premium £Y.

State 2. Pays full premium less 20%, i.e. he pays £0·8Y.

The process is Markovian since the probabilities associated with the different levels of premium in a given year depend only on the premium paid in the previous year. The matrix of transition probabilities for a holder of this type of policy, whose chances of making a claim are unaffected by his enjoying or not enjoying a discount, is

$$\mathbf{P}_1=\begin{array}{c c} & \text{Next premium} \\ & \begin{array}{cc} \text{Y} & 0{\cdot}8\text{Y} \end{array} \\ \text{present premium}\begin{array}{c} \text{Y} \\ 0{\cdot}8\text{Y} \end{array} & \begin{pmatrix} p & 1-p \\ p & 1-p \end{pmatrix} \end{array}$$

If the award of a discount served not just as a reward for a claim-free year, but also as an inducement towards further claim-free years, the appropriate matrix might then be of the form:

$$\mathbf{P}_2=\begin{pmatrix} p_1 & 1-p_1 \\ p_2 & 1-p_2 \end{pmatrix} \text{where } 1>p_1>p_2>0$$

and with the same convention as to the states associated with rows and columns.

The distribution of policyholders between premium groups

Although in practice it may be difficult for a company to identify a homogeneous group of policyholders, let us suppose by way of illustration that, in a particular year, an insurance company had a number of policyholders characterised by $\mathbf{P}_2$, of whom a proportion $f_1^{(n)}$ were paying full premium and the rest were receiving discount. Then, in the following year the proportions (assuming no new customers and no cancellations of policies) on full and reduced premiums, $f_1^{(n+1)}$ and $f_2^{(n+1)}=1-f_1^{(n+1)}$ respectively, would be given by

$$\mathbf{f}^{(n+1)}=\mathbf{f}^{(n)}.\,\mathbf{P}_2 \quad \ldots\ldots\ldots\ldots (7)$$

which is equivalent to equations (1) and (2) with

$$p_{11}=1-p_{21}=p_1$$

and $p_{12}=1-p_{22}=p_2$

Equilibrium (or steady-state) solution

If an equilibrium situation exists in which the proportions of the policyholders in the two categories eventually become constant, these equilibrium proportions

$$\mathbf{f}^{(\infty)}=(f_1^{(\infty)}, f_2^{(\infty)})$$

say, can be determined by letting n increase without limit in equation (3). Then we have

$$\mathbf{f}^{(\infty)}=\mathbf{f}^{(\infty)}.\,\mathbf{P} \quad \ldots\ldots\ldots\ldots (8)$$

It should be noted that the proportions in different states may be constant even though individuals may still be changing states, if the rates of change in each direction are equal. This phenomenon, known as dynamic equilibrium, can also occur in chemical reactions or among an electorate in which some voters switch allegiances between parties at successive elections.

A numerical example

In the case characterised by $\mathbf{P}_2$, suppose we have a company starting in year 0 with all its holders of this type of policy paying full premium.

i.e. $f_1^{(0)}=1$ and $f_2^{(0)}=0$

Further, let us suppose that, for all these policyholders,

$p_1=0{\cdot}02$ and $p_2=0{\cdot}01$

Then in Year 1 the proportions in the two states of premium payable will be given by

$$(f_1^{(1)}, f_2^{(1)})=(1, 0)\begin{pmatrix}0{\cdot}02 & 0{\cdot}98\\ 0{\cdot}01 & 0{\cdot}99\end{pmatrix}=(0{\cdot}02, 0{\cdot}98)$$

In Year 2 the proportions in the two states will be given by

$$(f_1^{(2)}, f_2^{(2)})=(0{\cdot}02, 0{\cdot}98)\begin{pmatrix}0{\cdot}02 & 0{\cdot}98\\ 0{\cdot}01 & 0{\cdot}99\end{pmatrix}=(0{\cdot}0102, 0{\cdot}9898)$$

and in Year 3 we expect

$$(f_1^{(3)}, f_2^{(3)})=(0{\cdot}0102, 0{\cdot}9898)\begin{pmatrix}0{\cdot}02 & 0{\cdot}98\\ 0{\cdot}01 & 0{\cdot}99\end{pmatrix}=(0{\cdot}010012, 0{\cdot}989988)$$

and so on.

In the long run:

$$(f_1^{(\infty)}, f_2^{(\infty)})=(f_1^{(\infty)}, f_2^{(\infty)})\begin{pmatrix}0{\cdot}02 & 0{\cdot}98\\ 0{\cdot}01 & 0{\cdot}99\end{pmatrix} \quad \ldots\ldots (9)$$

$$f_1^{(\infty)}=0{\cdot}02\, f_1^{(\infty)}+0{\cdot}01\, f_2^{(\infty)} \quad \ldots\ldots\ldots (10)$$

$$f_2^{(\infty)}=0{\cdot}98\, f_1^{(\infty)}+0{\cdot}99\, f_2^{(\infty)} \quad \ldots\ldots\ldots (11)$$

giving $f_2^{(\infty)}=f_1^{(\infty)}: 98:1$

Hence, in the long run only an average of one in 99 of these policyholders will be paying full premium; the rest will be enjoying discount.

In general, for the $\mathbf{P}_2$ situation, the equilibrium proportion paying full premium is $p_2/(1-p_1+p_2)$. So if, for example, the probabilities of claims increased tenfold, thus $p_1^{1}=0{\cdot}2$, $p_2^{1}=0{\cdot}1$, then in the long run one in nine policyholders (as compared with one in 99 previously) would pay full premium.

Looked at from the insurance company's point of view, in the equilibrium state, with a 20% discount offered, the average premium received per policy is

$$\left(\frac{p_2}{1-p_1+p_2}\right)Y+\left(1-\frac{p_2}{1-p_1+p_2}\right)0{\cdot}8Y$$

$=80{\cdot}2\%$ of full premium when $p_1=2p_2=0{\cdot}02$

or $82{\cdot}2\%$ of full premium when $p_1=2p_2=0{\cdot}20$

Failure to renew the policy

Let us suppose now that there are constant probabilities that the policy will not be renewed (either because the company refuses to renew the policy or the policyholder decides to take his business elsewhere) and that these probabilities may differ according to whether full or reduced premiums were paid in the last year. We further suppose that after a cancellation the ex-policyholder concerned is lost to the company for ever. This provision introduces a third state, which is an *absorbing* state. Let the appropriate matrix be

$$\mathbf{P}_3=\begin{array}{cc|ccc} & & \multicolumn{3}{c}{\text{Next premium}}\\ & & Y & 0{\cdot}8Y & \text{`0'}\\ \hline \text{Present premium} & Y & 0{\cdot}018 & 0{\cdot}980 & 0{\cdot}002\\ & 0{\cdot}8Y & 0{\cdot}009 & 0{\cdot}990 & 0{\cdot}001\\ & \text{`0'} & 0 & 0 & 1\end{array}$$

The equilibrium proportions are given by solving

$\mathbf{f}^{(\infty)}=\mathbf{f}^{(\infty)}.\ \mathbf{P}_3$

for $\mathbf{f}^{(\infty)}$, by which means we obtain

$f_1^{(\infty)}=f_2^{(\infty)}=0$, $f_3^{(\infty)}=1$

i.e. if this trend continued the company would ultimately lose all its policyholders, though this would only happen very slowly. Even after 64 years only about one in 16 of the original policyholders would have been lost as Table 1 shows.

TABLE 1

n	1	2	4	8	16	32	64
p_{13}	·002	·003	·005	·009	·017	·033	·0635
p_{23}	·001	·002	·004	·008	·016	·031	·0626

p_{13} denotes the proportion of clients initially paying full premium that will have been lost to the company in the following n years.

p_{23} is the corresponding proportion for clients who had discount initially.

Motor insurance policies with several levels of discount

Until a few years ago car insurance policies of the following type were common in the United Kingdom,

(*a*) The premium paid in the first year is Y. If no claim is made in the first year, a discount of $100\alpha\%$ is allowed in the second year, (so the premium charged is $(1-\alpha)Y$). If no claim is made for two consecutive years the discount is doubled, the resulting premium being $(1-2\alpha)Y$, and so on, with a limit on the maximum discount allowable, of the form: no further reductions after N consecutive claim-free years. In the event of a claim at any stage, the policyholder reverts to full premium in the following year.

e.g. Premium payable in year $n+1$

$=(1-n\alpha)Y, \quad 0\leqslant n<N$

$=(1-N\alpha)Y, \quad n\geqslant N$

The transition matrix for such a policy, neglecting cancellations, would be:

$$\mathbf{P}_4 = \text{Present premium}\ \begin{array}{c|cccccc} & \multicolumn{6}{c}{\text{Next premium}} \\ & Y & (1-\alpha)Y & (1-2\alpha)Y & (1-3\alpha)Y & \ldots\ldots & (1-N\alpha)Y \\ \hline Y & p & q & 0 & 0 & \ldots\ldots & 0 \\ (1-\alpha)Y & p & 0 & q & 0 & \ldots\ldots & 0 \\ (1-2\alpha)Y & p & 0 & 0 & q & \ldots\ldots & 0 \\ \ldots\ldots\ldots & \ldots & \ldots & \ldots & \ldots & \ldots\ldots & \ldots \\ (1-[N-1]\alpha)Y & p & 0 & 0 & 0 & \ldots\ldots & q \\ (1-N\alpha)Y & p & 0 & 0 & 0 & \ldots\ldots & q \end{array}$$

A variation of this type of policy was one which awarded the no-claim bonus as a fixed percentage of the previous year's premium instead of making a flat percentage reduction on the basic premium thus:

> (*b*) 'The premium paid in the first year is Y. If no claim is made in the first year, the premium in the second year is βY where β is a constant $(0<\beta<1)$. If no claim is made for two consecutive years, the premium in the next year is $\beta^2 Y$ and so on, so that in general, if no claim is made in n consecutive years, then:
>
> $$\text{premium payable in year } (n+1) = \beta^n Y, \quad 0 \leqslant n < N$$
> $$= \beta^N Y, \quad n \geqslant N$$
>
> (i.e. the lowest premium ever payable is $\beta^N Y$).
>
> If a claim is made, the premium for the following year reverts to Y and the whole procedure starts again.'

In the case of a policyholder for whom the probability of a claim in any one year is a constant, p, the transition matrix for annual premiums paid takes the form of $\mathbf{P}_4$ but the states differ, a premium of $(1-r\alpha)Y$ being replaced by $\beta^r Y$.

We observe that $\mathbf{P}_4$ has its last two rows identical. Let us write $\mathbf{M}_{(N+1)}$ to denote $\mathbf{P}_4$ with N+1 rows and N+1 columns. Then our matrix has the property that the rows of $\mathbf{M}^m{}_{(N+1)}$ (i.e. the mth power of $\mathbf{M}_{(N+1)}$) for $m \geqslant N$ are identical.

Thus for a 3-state process we have:

$$\mathbf{M}_{(3)} = \begin{pmatrix} p & q & 0 \\ p & 0 & q \\ p & 0 & q \end{pmatrix}, \ \mathbf{M}_{(3)}{}^2 = \mathbf{M}_{(3)}{}^3 = \mathbf{M}_{(3)}{}^4 = \ \ldots$$

$$= \begin{pmatrix} p & pq & q^2 \\ p & pq & q^2 \\ p & pq & q^2 \end{pmatrix} \ \ldots\ldots\ldots\ldots\ldots \ (13)$$

and for the 4-state process

$$\mathbf{M}_{(4)} = \begin{pmatrix} p & q & 0 & 0 \\ p & 0 & q & 0 \\ p & 0 & 0 & q \\ p & 0 & 0 & q \end{pmatrix}, \ \mathbf{M}_{(4)}{}^3 = \mathbf{M}_{(4)}{}^4 = \mathbf{M}_{(4)}{}^5 = \ .$$

$$= \begin{pmatrix} p & pq & pq^2 & q^3 \\ p & pq & pq^2 & q^3 \\ p & pq & pq^2 & q^3 \\ p & pq & pq^2 & q^3 \end{pmatrix}$$

and, generalising,

$$\mathbf{M}_{(N+1)} = \underbrace{\begin{pmatrix} p & q & 0 & \ldots\ldots & 0 & 0 \\ p & 0 & q & \ldots\ldots & 0 & 0 \\ \ldots & \ldots & \ldots & \ldots\ldots & \ldots & \ldots \\ p & 0 & 0 & \ldots\ldots & 0 & q \\ p & 0 & 0 & \ldots\ldots & 0 & q \end{pmatrix}}_{\text{— (N+1) columns —}} \updownarrow \text{N+1 rows}$$

$$\mathbf{M}^N{}_{(N+1)} = \mathbf{M}^{N+1}{}_{(N+1)} = \ \ldots$$

$$= \begin{pmatrix} p & pq & pq^2 & \ldots\ldots & pq^{j-1} & \ldots\ldots & pq^{N-1} & q^N \\ p & pq & pq^2 & \ldots\ldots & pq^{j-1} & \ldots\ldots & pq^{N-1} & q^N \\ \ldots & \ldots & \ldots & \ldots\ldots & \ldots & \ldots\ldots & \ldots & \ldots \\ p & pq & pq^2 & \ldots\ldots & pq^{j-1} & \ldots\ldots & pq^{N-1} & q^N \end{pmatrix}$$

Thus, with N levels of discount in addition to the full premium level, after N years, the probabilities associated with the different states are independent of the initial states.

Alternatively the vector $\mathbf{f}^{(\infty)}$ of the ultimate proportions in the various states could be determined directly from the equilibrium equations

$$\mathbf{f}^{(\infty)} = \mathbf{f}^{(\infty)} . \mathbf{M}_{(N+1)}$$

e.g. with N=2

$$\mathbf{f}^{\infty} = (f_1{}^{(\infty)}, f_2{}^{(\infty)}, f_3{}^{(\infty)}) \begin{pmatrix} p & q & 0 \\ p & 0 & q \\ p & 0 & q \end{pmatrix}$$

$$= (p, f_1{}^{(\infty)} q, [1-f_1{}^{(\infty)}]\, q)$$

since $f_1{}^{(\infty)} + f_2{}^{(\infty)} + f_3{}^{(\infty)} = 1$

and $p+q=1$

Hence $f_1{}^{(\infty)} = p, \quad f_2{}^{(\infty)} = pq, \quad f_3{}^{(\infty)} = q^3$

which agrees with the result in equation (13).

(*c*) Policies of the type characterised by the matrix $\mathbf{P}_4$ had the unpleasant effect of depriving even someone who had enjoyed the maximum discount for a number of years, of *all* his no-claim bonus if he had even a single claim in any year. Policies such as the one cited at the beginning of this paper (see matrix $\mathbf{P}_5$ below) were a little gentler, allowing the claimant to retain part of the bonus he had earned.

$$\mathbf{P}_5 = \begin{array}{cc} & \text{Premium next year} \\ & \begin{array}{ccccc} Y & \cdot 7Y & \cdot 6Y & \cdot 5Y & \cdot 4Y \end{array} \\ \text{premium this year} \begin{array}{c} Y \\ \cdot 7Y \\ \cdot 6Y \\ \cdot 5Y \\ \cdot 4Y \end{array} & \left(\begin{array}{ccccc} p & q & 0 & 0 & 0 \\ p & 0 & q & 0 & 0 \\ p & 0 & 0 & q & 0 \\ 0 & p & 0 & 0 & q \\ 0 & 0 & p & 0 & q \end{array} \right) \end{array}$$

Solving the equations

$$\mathbf{f}^{(\infty)} = \mathbf{f}^{(\infty)} . \mathbf{P}_5$$

gives

$$\mathbf{f}^{(\infty)} = (1-2pq^2)^{-1} (p^2[1+pq], p^2q[1+q], pq^2, pq^3, q^4)$$

which implies an average per policyholder of

$$£Y[p^2(1+2pq)+0{\cdot}7\, p^2q(1+q)+0{\cdot}6pq^2+0{\cdot}5pq^3+0{\cdot}4q^4]/(1-2pq^2)$$

An insurance company will want to take note of the falling revenue from policies in succeeding years and of its ultimate income in order to ensure that claims can be met. The diminished value of £1 paid in several years' time compared with £1 now[†] and the increasing sums involved in settlement of claims imply that either premiums must be revised upwards every few years or that – less likely – lower discounts will have to be offered.

A Non-Markovian policy

Consider next a policy which offers discounts as in the case of $\mathbf{P}_4$ but requires that the 50% discount rate be earned for two consecutive years before the maximum of 60% discount is allowed.

At first sight this appears to violate the Markovian property since the probability of being on a premium of $0{\cdot}4Y$ in year $n+1$ is dependent not only on the premium paid in year n but also on that for year $n-1$. However this obstacle can be overcome by re-defining the states, thus:

$$\mathbf{P}_6 = \begin{array}{ccc} \text{Next premium} & & \begin{array}{ccccc} Y_0 & Y_1 & Y_2 & Y_2 & Y_3 \end{array} \\ \text{Next state} & & \begin{array}{ccccc} 0 & 1 & 2 & 3 & 4 \end{array} \\ \text{Current premium} \begin{array}{c} Y_0 \\ Y_1 \\ Y_2 \\ Y_2 \\ Y_3 \end{array} & \text{Current state} \begin{array}{c} 0 \\ 1 \\ 2 \\ 3 \\ 4 \end{array} & \left(\begin{array}{ccccc} p & q & 0 & 0 & 0 \\ p & 0 & q & 0 & 0 \\ p & 0 & 0 & q & 0 \\ p & 0 & 0 & 0 & q \\ p & 0 & 0 & 0 & q \end{array} \right) \end{array}$$

State 2 means 'Pay premium Y_2 next year having paid Y_1 this year'

State 3 means 'Pay premium Y_2 next year having paid Y_2 this year'

The matrix $\mathbf{P}_6$ now represents a Markov chain.

Testing models

In order to examine whether the operation of a certain type of policy behaves according to a Markov chain, it is necessary to collect data, preferably for a given group or cohort of policyholders and to follow the progress of their premiums over successive years. Estimates of the transition probabilities can then be made and these can be used to estimate the numbers that would be expected in the various categories in succeeding years, on the assumption of a Markov model.

Two obvious departures from the conditions assumed in this paper would be (*a*) transition probabilities that were not constant but changed with time, (*b*) a population of policyholders that did not consist of one or more homogeneous groups. Indeed a typical population has been likened to a spectrum that has to be forced into classes. However, it might still be possible sometimes to identify a few well-defined categories such as policyholders who never claim or those who claim frequently and pay full premium year after year.

Conclusion

Markov chain models thus offer a promising approach to the study of the performance of motor insurance policies. Whilst, as with any mathematical or statistical techniques, these should not be applied indiscriminately but only advisedly in the light of sound business experience, there is a growing volume of evidence (see e.g. Johnson *et. al.* (1972)) that, given appropriate safeguards, there are real benefits to be achieved from this approach.

References

W. Feller (1968), *An Introduction to Probability Theory and its Applications Vol.* 1. (Third Edition) New York: Wiley.

F. Ayres (1962). *Theory and Problems of Matrices.* New York: Schaum.

P. D. Johnson and G. B. Hey (1972). *A review of the scope for using claims histories of individual policies in risk assessment.* J. Inst. Actuaries.

[†] A 5% p.a. inflation rate will reduce the value of £1 by half in about fourteen years. A 10% rate will do so in seven years.

Postulates, Principles and Rules

Boris Popoff

One of the most difficult tasks facing accounting researchers today is that of developing a uniform body of accounting theory to provide guidance to and logical justification for accounting practice.

In 1958 the AICPA's Special Committee on Research Programme made the following recommendations as to a new approach to accounting research and the formulation of accounting principles[1]:

> 'The broad problems of financial accounting should be visualised as requiring attention at four levels: first, postulates; second, principles; third, rules and other guides for the application of principles in specific situations; and fourth, research.'

Postulates were defined as being

> '. . . the basic assumptions on which principles rest. They necessarily are derived from the economic and political environment and from the mode of thought and customs of all segments of the business community.'

Regarding postulates it was further stated that:

> 'The profession should make clear its understanding of what they are, to provide a meaningful foundation for the formulation of principles and the development of rules or other guides for the application of principles in specific situations'.

It was recommended that:

> 'A fairly broad set of co-ordinated accounting principles should be formulated on the basis of the postulates. . . . The principles, together with the postulates, should serve as a framework of reference for the solution of detailed problems.'

Regarding rules it was recommended that these should be developed 'in relation to the postulates and principles previously expressed'.

The underlying characteristic of the new approach to the definition of acceptable accounting practice was to be normative:

> 'This means something more than a survey of existing practice. It means continuing effort to determine appropriate practice and to narrow the areas of difference and inconsistency in practice.'

The report recommended that priority should be given to

> '. . . a study of basic postulates underlying accounting principles generally, and a study of the broad principles of accounting.'

The immediate outcome of these recommendations were the accounting research studies numbers 1 and 3 by Moonitz, and Sprouse and Moonitz.

It is not the purpose of this paper to examine in any detail these studies or the aftermath of their publication. Nor is it to develop a new theory of accounting calculated to lead to the ready solution of the current intractable problems of accounting. The purpose of this paper is rather to define *an approach* to the development of an overall framework of accounting theory based on internally consistent postulates and principles as recommended by the Special Committee.

It is proposed that the starting point in the derivation of accounting postulates should be a study of the accounting function in society. It is hoped that such a starting point would lead to the development of a theoretical framework of reference which is rooted in reality and which would, therefore, stand a reasonable chance of general acceptance.

Having derived a number of basic accounting postulates from an examination of the accounting function, a number of accounting principles will be defined (at least by way of illustration) and would be tested for consistency both with the underlying postulates and as among themselves in the building up of an overall internally consistent theoretical framework of reference.

Finally, an attempt will be made to illustrate the application of the theory to a particular problem area in financial reporting.

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[1] 'Report to Council of the Special Committee on Research Programme', *Journal of Accountancy*, December 1958, pp. 62–68.

It will be argued that the theory to be proposed is of a dynamic character and has a built in propensity for adaptability and change.

Like the recommendations of the Special Committee, this paper is confined essentially to the field of financial accounting – the field of external reporting.

Postulates

Accounting has its roots in economic activity. To quote from A. C. Littleton's and V. K. Zimmerman's book *Accounting Theory: Continuity and Change:*

> Centuries ago men became effective consumers, producers, and traders without having a definite knowledge of science, economics, or philosophy. They became consumers to survive. They became producers to secure goods to consume. They became traders so that the means available to satisfy their wants would be increased in variety. In short, these men applied economics. They did not philosophise about consuming, producing, trading, or keeping accounts. They daily lived with these activities and managed their lives and their enterprises to the best of their ability.
>
> It was this working at living that produced business enterprises and, quite logically, enterprise accounts.[2]

Accounting methods and technology were developed in response to needs – the needs of businessmen and business enterprises, the needs of an investing public. The modern economic, political and social environment has created a wide diversity of interests in external accounting reports – not only the interests of management and shareholders but also the interests of organised labour, organised consumer groups government regulatory agencies, competitors, society at large. Yet these diverse and often conflicting interests have a common bond – they are economic interests; they are interests of producers and consumers, of regulators of the economy, of suppliers of capital and finance.

It is proposed, therefore, that any set of basic accounting postulates should recognise two vital points arising from the accounting function:

(1) They should recognise the essentially economic nature of accounting events; and

(2) They should recognise the diversity of interests in accounting reports, a diversity which raises the question of 'fairness' in company reporting.

Leonard Spacek commented as follows on Moonitz's Research study No. 1:

> My own view is that the one basic accounting postulate underlying accounting principles may be stated as that of fairness – fairness to all segments of the business community . . . determined in the light of economic and political environment and the modes of thought and customs of all segments – to the end that the accounting principles based upon this postulate shall produce financial accounting for the lawfully established economic rights and interests that is fair to all segments.[3]

The basic descriptive postulate of accounting and postulates derived from it:

A study of the accounting function for the purpose of deriving basic accounting postulates must begin with a description of this function of accounting, the definition of explicit or implicit objectives and the setting of 'norms'. It follows that the basic postulates will be 'descriptive', 'definitive' and 'normative'.

What is the function of financial accounting?

(*a*) Financial accounting records, analyses and interprets accounting information.

(*b*) The accounting information recorded, analysed and interpreted relates to the results of operations and the state of affairs of accounting entities.

(*c*) The final output of the accounting process is the accounting report.

The above description of the function of financial accounting will be further extended (in a normative form) to recognise the economic nature of accounting events:

(*d*) The results of operations and the state of affairs with which financial accounting is concerned should be the economic results and economic state of affairs of the accounting entity.

We may now define *the basic descriptive postulate of accounting* as follows:

> *Accounting records, analyses and interprets,*[4] *and reports information about the economic results of operations and economic position of entities.*

It may be argued that the above postulate largely states the obvious. This may be so but it should be remembered that we are postulating the function of financial accounting essentially in retrospect. Further, it is essential that a basic statement of this kind should be deeply rooted in reality if further postulates and principles derived from it are to continue to have relevance to real life and so have a reasonable chance of attaining general acceptance by the accounting profession.

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[2] A. C. Littleton and V. K. Zimmerman, '*Accounting Theory: Continuity and Change*', Prentice-Hall, Inc. Englewood Cliffs, N.J., 1962, p. 19.

[3] Leonard Spacek, comments on Moonitz's Research Study No. 1, '*The Basic Postulates of Accounting*', AICPA, New York, 1961, p. 57.

[4] The terms 'analysis' and 'interpretation' are used here in the sense of analysis and accumulation of accounting data into various account categories and the meaningful relating of the data in the production of, say, operating statements and balance sheets.

Postulates derived from the basic descriptive postulate of accounting

We may now examine the components of the basic descriptive postulate. These are:

recording
analysis and interpretation
reporting of information
economic results of operations
economic position
entities

From the above break-down of the basic postulate we may derive the following additional 'normative' postulates:

Postulate 1:

Analysis and interpretation should be relevant to explicit and implicit objectives.

Postulate 2:

The criterion for determining relevance and validity of analysis and interpretation should be the ability of the same to reflect 'economic truth'.

From Postulate 2 we may derive a postulate of neutrality:

Postulate 3:

The analysis and interpretation should be neutral in the face of conflicting interests.

The term 'neutrality' in Postulate 3 is used in the sense of neutrality in terms of 'economic truth'. For example, the measurement of income in terms of 'economic truth' will be neutral as between the special interests of directors, shareholders, investors, trade unions, consumers, competitors, possible entrants into an industry, and society at large. Postulate 3 is derived from and aims to reinforce Postulate 2. The author believes that only accounting reports which reflect 'economic truth' can be said to achieve the 'fairness' to all segments of the business community (and society in general) which Spacek described as 'the one basic accounting postulate underlying accounting principles.[5]

Postulate 3 does not preclude the preparation of accounting reports for special purposes. What it requires is a neutral basis for the preparation of such reports. 'Truth' is 'what it is'! For example in times of rising prices one should not use historic costs in order to report inflated profit figures to shareholders and investors while at the same time holding out increased replacement costs as arguments in resisting claims for increases in wages. To do so would be to open oneself to charges of duplicity.

Regarding the reporting aspect of financial accounting we may define a postulate of communication as follows:

Postulate 4:

Given economic truth of contents, the accounting reports should be so prepared as to effectively communicate to the reader the information contained in the reports.

In addition to the above postulates, it would be necessary to postulate the nature of the accounting entity. The definition of the entity in economic terms, as proposed by Moonitz[6] is not inconsistent with the foregoing analysis.

Postulates 1 to 4 have been expressed in the imperative in order to underline the purposive nature of the exercise – to provide ultimately a basis for a

> '. . . continuing effort to determine appropriate practice and to narrow the areas of difference and inconsistency in practice.'[7]

One may argue that 'normative' postulates cannot lead to 'neutral' results. The answer to this would be that while 'truth' is neutral because 'it is what it is', the search for truth often has to be a very purposeful exercise. In accounting, truth has to be related to purpose.

The postulate of continuity:

In addition to the above postulates one would need to recognise, explicitly or implicitly, a very important and basic assumption underlying accounting practice – the assumption of continuity. The assumption of continuity has very important implications in the valuation of assets and the measurement of income. We may recognise this assumption as Postulate 5:

Postulate 5:

In the absence of evidence to the contrary, the entity is assumed to be a continuing one.

The very basic nature implied to accounting postulates requires that they are broadly stated in order to give them greater permanence than is likely to attach to, say, principles and even less to rules.

For example, Postulate 2 states that the criterion for determining the relevance and validity of accounting analysis and interpretation should be their ability to reflect 'economic truth'. The postulate does not define what 'economic truth' is. This definition should be made in terms of principles such as principles for the measurement of capital and income and the concepts of capital and income which such principles reflect. The postulate of economic truth, however, would require a continuous examination of the principles and concepts chosen to determine their continuing validity in the face of growing knowledge and a changing social, economic and political environment. For example, in times of changing prices, the postulate of economic truth may be used to reject a principle of income measurement and asset valuation based on historic cost.

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[5] Leonard Spacek, *op.cit.*

[6] Moonitz, M., *'The Basic Postulates of Accounting'*, *op.cit.*, pp. 12–13.

[7] 'Report to Council of the Special Committee on Research Programme', *op. cit.* p. 62.

Postulate 1 states that accounting analysis and interpretation should be relevant to explicit and implicit objectives. Again the objectives are not specifically defined, although some objectives may be derived by implication – e.g. an objective of communicating information about the operating results and position of entities. The omission of a specific definition of objectives is deliberate because at any one time the objectives of accounting analysis and interpretation, and ultimately of communication will depend on the social, political, economic and legal environment and will also be subject to social, political, legal, ethical, practical and economic constraints. It is also likely that with changes in the accounting environment, accounting objectives will also change.

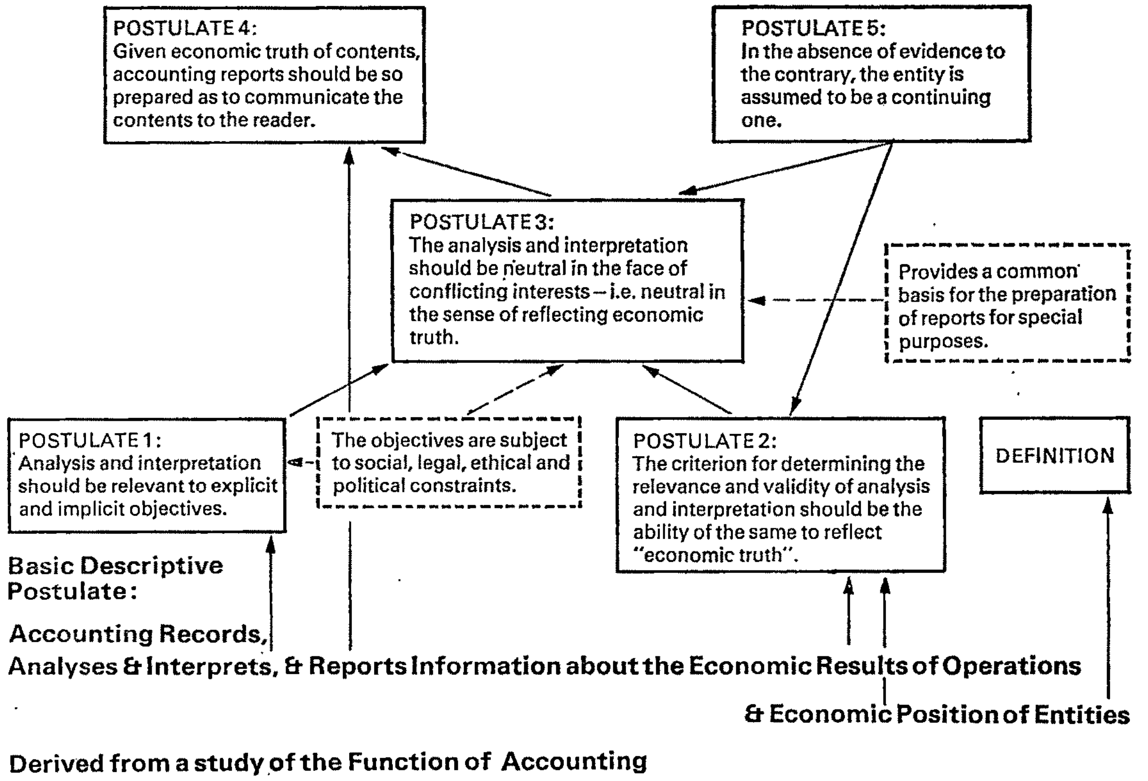
Finally, the important assumption has been made that the accountant will have the freedom to carry out his task within the framework of the postulates defined, and be neutral in the face of conflicting interests. For example, accounting is practised in different countries with different forms of government and different philosophies as to systems of economic and political organisation. For this reason, a set of accounting postulates and principles which is suitable for evaluating accounting practices in an essentially free enterprise economy may be largely irrelevant to an environment where economic activity is under state control.

A graphic illustration of the inter-relationship of the postulate formulated above is given in Exhibit 1.

Principles

It is not claimed that the preceding list of postulates is exhaustive. The objective of this paper has been to define *an approach* to the development of an overall framework of accounting theory based on internally consistent postulates and principles. The list of postulates, however, should be sufficient to allow us to proceed to show, at least, by way of an illustration, how accounting principles may be derived from the postulates and tested for logical consistency with the same.

EXHIBIT 1
Postulates and their Interrelationship


POSTULATE 4:
Given economic truth of contents, accounting reports should be so prepared as to communicate the contents to the reader.
POSTULATE 5:
In the absence of evidence to the contrary, the entity is assumed to be a continuing one.
POSTULATE 3:
The analysis and interpretation should be neutral in the face of conflicting interests – i.e. neutral in the sense of reflecting economic truth.
Provides a common basis for the preparation of reports for special purposes.
POSTULATE 1:
Analysis and interpretation should be relevant to explicit and implicit objectives.
The objectives are subject to social, legal, ethical and political constraints.
POSTULATE 2:
The criterion for determining the relevance and validity of analysis and interpretation should be the ability of the same to reflect "economic truth".
DEFINITION
Basic Descriptive Postulate:
Accounting Records, Analyses & Interprets, & Reports Information about the Economic Results of Operations & Economic Position of Entities
Derived from a study of the Function of Accounting

(1) Monetary principles

The first principle we may define is a monetary principle derived from the recording function of financial accounting as stated in our basic postulate:

Principle 1:1

In order to be recorded, accounting transactions should be expressed in monetary terms.

We may now test this principle for logical consistency with the other postulates. For example, we may argue that because of the unstable purchasing power of the monetary unit, analysis and interpretation in monetary terms will not reflect 'economic truth' and would, therefore, be inconsistent with Postulate 2. We may, therefore –

(*a*) reject the monetary principle as an acceptable basis for the recording of accounting transactions and define an alternative principle, or

(*b*) we may modify the principle by formulating another principle, for example –

Principle 1:2

Accounting transactions should be recorded in dollars of comparable purchasing power.

We may now test Principle 1:2 for consistency with Postulate 1 which requires accounting analysis and interpretation to be relevant to explicit or implicit accounting objectives. One may examine critically the relevance of applying, for example, a general price level adjustment to the particular situation of a specific industry or firm. As a result of such an examination, it may be found necessary to, say, modify Principle 1:2 or to define further monetary principles.

A graphic illustration of the relationship between the monetary principles defined and the underlying postulates is shown in Exhibit 2.

(2) Communication principles:

From the reporting function of financial accounting as stated in the basic descriptive postulate and Postulate 4 which requires that, given truth of contents, accounting reports should be so prepared as to *communicate* the information to the reader; and Postulate 5 which assumes continuity of activity, we can derive a number of '*communication principles*'. These may include the following:

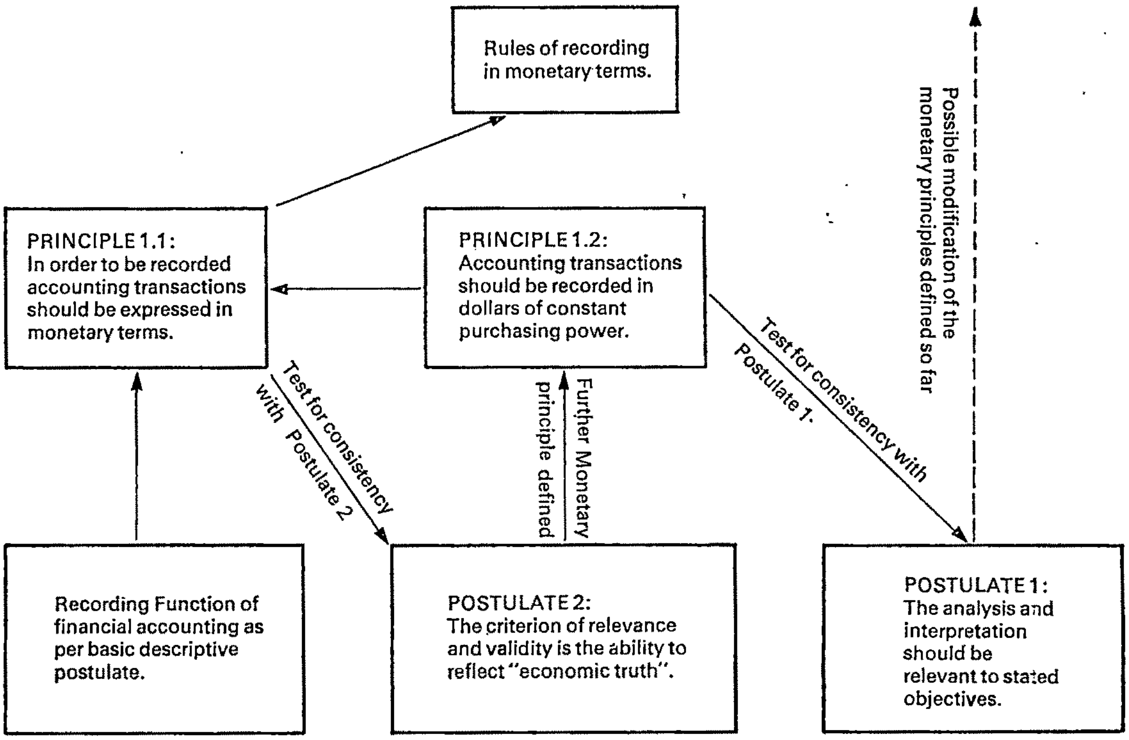
Principle 2:1

Periodic reporting: periodic reports should be prepared dealing with the operating results and financial position of the accounting entity.

Principle 2:2

Comparability: the information reported in different

EXHIBIT 2
Monetary Principles and Underlying Postulates


Rules of recording in monetary terms.
PRINCIPLE 1.1: In order to be recorded accounting transactions should be expressed in monetary terms.
PRINCIPLE 1.2: Accounting transactions should be recorded in dollars of constant purchasing power.
Possible modification of the monetary principles defined so far
Test for consistency with Postulate 2
Further Monetary principle defined
Test for consistency with Postulate 1.
Recording Function of financial accounting as per basic descriptive postulate.
POSTULATE 2: The criterion of relevance and validity is the ability to reflect "economic truth".
POSTULATE 1: The analysis and interpretation should be relevant to stated objectives.

accounting periods should be comparable.

Related to Principle 2:2 is the principle of consistency:

Principle 2:3

Consistency: in order to ensure comparability, accounting principles should be consistently applied from one accounting period to another.

(Note: The principles of comparability and consistency may be extended so as to require specifically comparability of the accounts of different companies.)

Principle 2:4

Classification: accounting information should be classified in a manner appropriate to the nature of the particular entity and the objectives of the accounting communication.

Principle 2:5

Materiality: all 'material' items should be disclosed.

'Materiality' in this sense may be defined in terms of levels of significance in relation to explicit or implicit objectives.

Principal 2:6

Simplicity: in reporting, unnecessary detail should be avoided; 'material' items should be highlighted.

It is not claimed that the above list of communication principles is exhaustive. The list may be extended or the nature of the principles modified in order to meet more specifically defined objectives. For example, the principle of comparability implies a need to establish trends which in turn implies an objective of providing information for predicting the future prospects of the entity concerned. A specifically defined objective of prediction may require the formulation of more specific information principles aimed to ensure that relevant information is provided.

It should be noted that for an internally consistent framework of reference, the communication principles should, among other things, be consistent with the postulate of economic truth. For example, if we reject historic cost as a basis of income measurement and asset valuation, the consistent application of historic cost in external reporting would not amount to a compliance with the communication principle of consistency. The principle would rather require the consistent application of principles of income measurement and valuation which would ensure effective comparability of, say, income and financial position in economic terms.

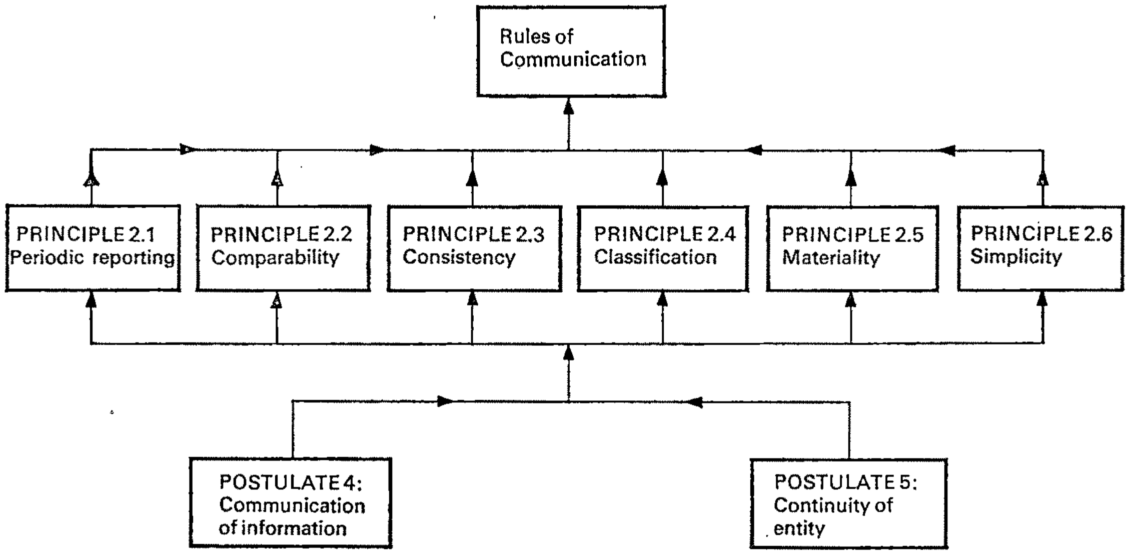
From the communication principles rules of communication will be formulated dealing with the form and presentation of the accounting reports, basic and supplementary reports, manner and extent of disclosures, etc.

A graphic illustration of the relationship between the communication principles and the underlying postulates is shown in Exhibit 3.

(3) The measurement of capital and income

The measurement of income is dependent on the measurement of capital. All concepts of income assume a certain 'stock' of capital which must be

EXHIBIT 3
Communication Principles and Underlying Postulates


Rules of Communication
PRINCIPLE 2.1 Periodic reporting
PRINCIPLE 2.2 Comparability
PRINCIPLE 2.3 Consistency
PRINCIPLE 2.4 Classification
PRINCIPLE 2.5 Materiality
PRINCIPLE 2.6 Simplicity
POSTULATE 4: Communication of information
POSTULATE 5: Continuity of entity

maintained before income can be recognised. In the accounting context, the measurement of capital depends on the valuation of the resources owned by the entity and the measurement of equitable claims against these resources.

In the company situation the term capital is used, in a narrow sense, to denote the funds permanently committed to the enterprise – the paid-up value of the company's share capital. In a broader sense, the term capital may be used to denote the shareholders' equity which includes both paid-up capital and reserves. It is in the latter sense that the term capital is used in this paper.

The measurement of equitable claims should create no serious problems – some would arise as a result of direct operation of law (for example the obligation to pay tax), others will be determined on the basis of explicit or implicit agreements between the entity and the equity-holders and between the equity-holders themselves.

The major problems of capital measurement and, therefore, of income measurement relate to asset valuation.

The principles adopted for the measurement of capital and income should be consistent with the underlying postulates and other principles formulated on the basis of the postulates in order to ensure the internal consistency of the overall framework of reference. For example, the principles selected should be capable (conceptually at least) of producing results which are consistent with economic reality within the overall context of the accounting function.

Let us now attempt to develop a possible framework of reference regarding the measurement of capital and income consistent with the conditions stated above. It is not proposed to define directly different concepts of capital and income and to test these for consistency with underlying postulates and relevance to explicit or implicit accounting objectives. Rather it is proposed to examine alternative principles of capital and income measurement and the concepts of capital and income which they imply. It is hoped that this approach will direct our study to concepts of capital and income which are relevant to the accounting environment and function, and will at the same time centre attention on the essentially practical problems of their measurement.

Principles of asset valuation and capital measurement

The following alternative principles of asset valuation and capital measurement may be lised:

3.1.1. Historic cost (depreciated where appropriate).

3.2.1. Historic cost restated in dollars of comparable purchasing power (with depreciation similarly restated).

3.1.3. Current replacement cost.

3.1.4. Market value.

The process of selection will involve a critical examination of the alternatives in relation to the underlying postulates and any other principles already formulated. For example we may reject historic cost as a basis of valuation in times of changing prices as failing to reflect current economic reality and being irrelevant to the measurement of the economic resources of a business enterprise (e.g. inconsistency with Postulate 2). We may also examine critically the relevance of restating the historic cost of specific assets for changes in the general purchasing power of the dollar and the validity of the results produced in terms of economic truth (e.g. test for consistency with Postulate 2). We may examine alternative indices for ability to achieve economic truth within the accounting context. We may decide to adopt current replacement cost as a true measure of the current economic significance of the material resources of a continuing entity (consistency with Postulates 2 and 5) and as ensuring effective intercompany comparability (consistency with Postulate 4 and Principle 2.2). However, we may also decide that for assets no longer necessary to ensure the continuing operations of the enterprise, market value would provide a better measure of the economic significance of the asset to the enterprise. Finally, in order to be consistent with the monetary principle(s), asset valuation should be made in terms of money.

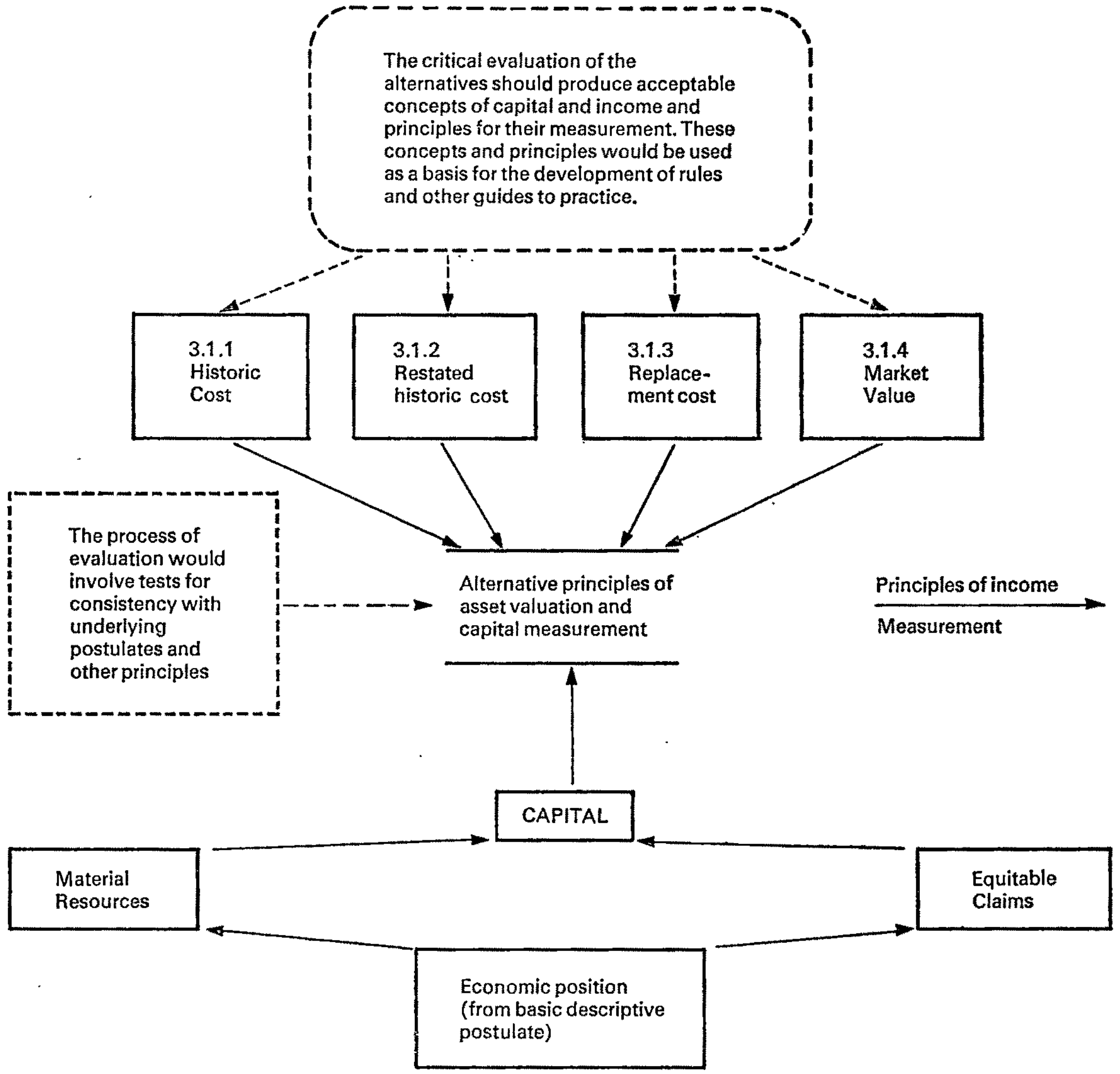
The relationship of the alternative principles of asset valuation to the underlying postulates and other principles is illustrated graphically in Exhibit 4.

Accountants as measurers of capital and income have a natural desire for certainty and objectivity in accounting measurement. In fact, 'truth' implies both 'certainty' and 'objectivity'. Therefore, in addition to the above principles of asset valuation and capital (and income) measurement, we would have to define principles of realisation and objectivity consistent with the postulates of relevance, neutrality and economic truth. For example, we may reject (on the grounds of uncertainty and lack of objectivity), the alternative of asset valuation by discounting expected future cash flows.

The measurement of income

The income of an enterprise may be measured by the amount by which the value of its net assets have increased over a given period of time, after adjustments have been made for new capital brought in or capital withdrawn during the period. In order to determine income in this manner, it is necessary to value the assets of the enterprise at the beginning and

EXHIBIT 4
Alternative Principles for Asset Valuation and Capital Measurement


The critical evaluation of the alternatives should produce acceptable concepts of capital and income and principles for their measurement. These concepts and principles would be used as a basis for the development of rules and other guides to practice.
3.1.1 Historic Cost
3.1.2 Restated historic cost
3.1.3 Replacement cost
3.1.4 Market Value
The process of evaluation would involve tests for consistency with underlying postulates and other principles
Alternative principles of asset valuation and capital measurement
Principles of income Measurement
CAPITAL
Material Resources
Equitable Claims
Economic position (from basic descriptive postulate)

end of the accounting period.

This is not done in practice. Instead, the generally accepted accounting principle of income measurement is matching cost with revenue. The matching principle implies recovery (maintenance) of capital by subtracting from revenue the cost incurred in earning the revenue. This principle has the advantage of measuring the results of operations and, to the extent that accounts are used for predictive purposes, the long term operating viability of the firm.

We may, therefore, accept the matching of cost with revenue as the basic principle for the measurement of operating income:

Principle 3.2.1. Matching cost with revenue:
The operating income for a period should be measured by matching against revenue all costs incurred in earning the revenue.

In order to arrive at our 'total income', however, we may have to make adjustments to operating income to incorporate any changes in the value of assets taken into account in the measurement of capital but not incorporated in the matching process.

In his 'Inventory of Generally Accepted Accounting Principles for Business Enterprises' Paul Grady defined the matching principle as follows:

> Costs of sales and expenses should be appropriately matched against the periodic sales and revenues. It follows that there must be proper cut-off accounting for inventories and liabilities for costs and expenses at the beginning and end of the period or

periods.[8]

Under the proposed framework of reference the appropriateness of the matching process would depend on the degree to which the output of the process reflects the 'economic truth' about the operating results of a period. This should mean more than a mere sorting out of assets and liabilities, costs and expenses on the correct side of the cutoff point at balance date. Consistency with Postulate 2 would require, for example, the selection of the appropriate concept of cost to be applied to the matching process. It is logical also to say that the extent to which costs may be carried forward would depend on the extent of the economic benefits which these costs are expected to confer to future accounting periods.

The matching principle creates two problems: the recognition of revenue and the measurement of cost.

Regarding the recognition of revenue we may adopt the principle of realisation in its traditional context (i.e. realisation by way of sale) or may modify the principle. The action taken should be consistent with the underlying postulates.

Principle 3.2.2. Realisation.

The following are alternative principles for the measurement of cost:

Principle 3.2.3. Historic cost.

Principle 3.2.4. Historic cost restated in common dollars.

Principle 3.2.5. Replacement cost.

The principles selected for the measurement of cost should not be inconsistent with the principles selected for the purpose of asset valuation and measurement of capital. For example, if, in times of changing prices, we reject historic cost as a principle for asset valuation on the grounds that it fails to reflect economic reality, we should also reject it on the same grounds, as a basis of cost measurement in the matching process. The same considerations would apply to the principle of restating historic cost in dollars of comparable purchasing power. In the same line of reasoning, if we adopt replacement cost as the most appropriate principle for the valuation of the assets of a continuing concern, we should adopt replacement cost as the appropriate basis for matching cost with revenue.

The continuity assumption is important in the measurement of capital and income. It relates not so much to the practice of periodic reporting which is the result of the *fact* that business operations extend over periods longer than the accounting period, as to the valuation of assets and the measurement of costs. The valuation of assets on a liquidation basis may be irrelevant to a going concern. The valuation of assets and the measurement of cost on the assumption of a going concern is essential in order to determine whether we do in fact have a going concern. The latter is important to the extent that published reports are used for the purposes of prediction.

The adoption of replacement cost as a basis for asset valuation and cost measurement raises the question of the treatment of holding gains and losses in relation to income measurement. Whether we treat these as part of income[9] or as adjustments to capital[10] would depend on the ability of the resulting income figure to reflect truthfully, in economic terms, the growth of material resources.

The alternative principles of income measurement are graphically illustrated in Exhibit 5.

Principles and practicality

No direct attention has been paid so far to the practicality of the principles suggested. This omission has been deliberate. Tests of practicality should apply essentially to the formulation of rules. To apply tests of practicality to the formulation of principles could have a retarding effect on accounting research because, say, of the inadequacy of accounting methods and techniques of the present time. On the other hand, the formulation of sound accounting principles may provide the necessary stimulus for the development of better accounting methods and techniques.

Rules

Because of the essentially utilitarian nature of accounting, rules and other guides to practice should not only be logically consistent with underlying accounting principles and postulates but should also be capable of efficient practical application. Because the suggested method for the formulation of principles has been left essentially free from the requirements of practicality, some compromise between conceptual consistency and the requirements of practicality is bound to be necessary in the formulation of rules. The extent of the compromise will be a measure of the inability of existing accounting techniques to attain desirable accounting objectives.

Our analysis so far has produced tentative principles of communication and of capital and income measurement.

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[8] Grady, P., 'Inventory of Generally Accepted Accounting Principles for Business Enterprises', *Accounting Research Study No.* 7, AICPA, New York, p. 99.

[9] As suggested by Edwards and Bell – E. O. Edwards and P. W. Bell, *The Theory and Measurement of Business Income*, University of California Press, Berkeley and Los Angeles, 1961.

[10] As advocated by R. L. Mathews – 'Price-Level Changes and Useless Information,' *Journal of Accounting Research*, Vol. III (Spring 1965), pp. 133–55; and R. S. Gynther, *Accounting for Price Level Changes: Theory and Procedures*, Oxford, England, Pergamon Press, 1966, p. 79.

EXHIBIT 5
Alternative Principles of Income Measurement

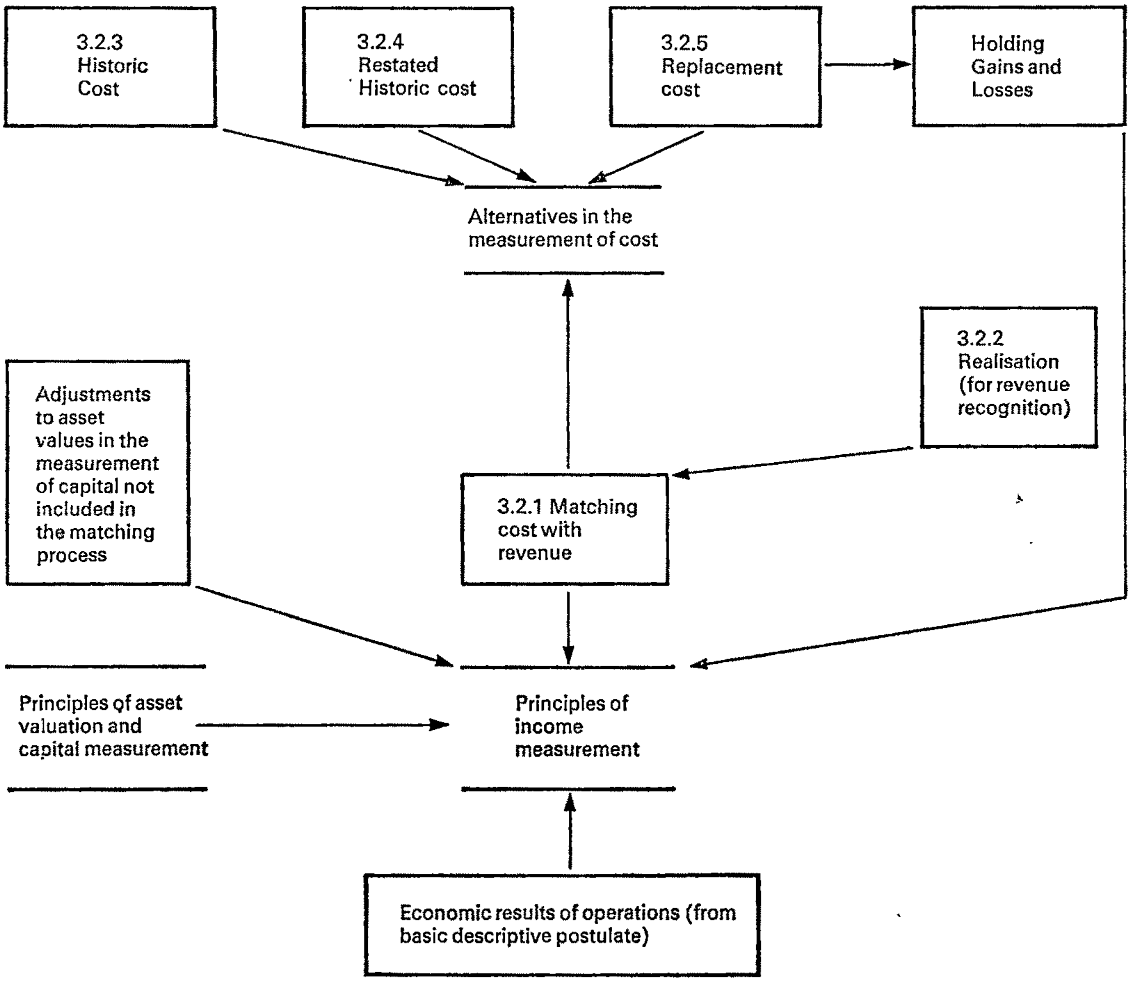
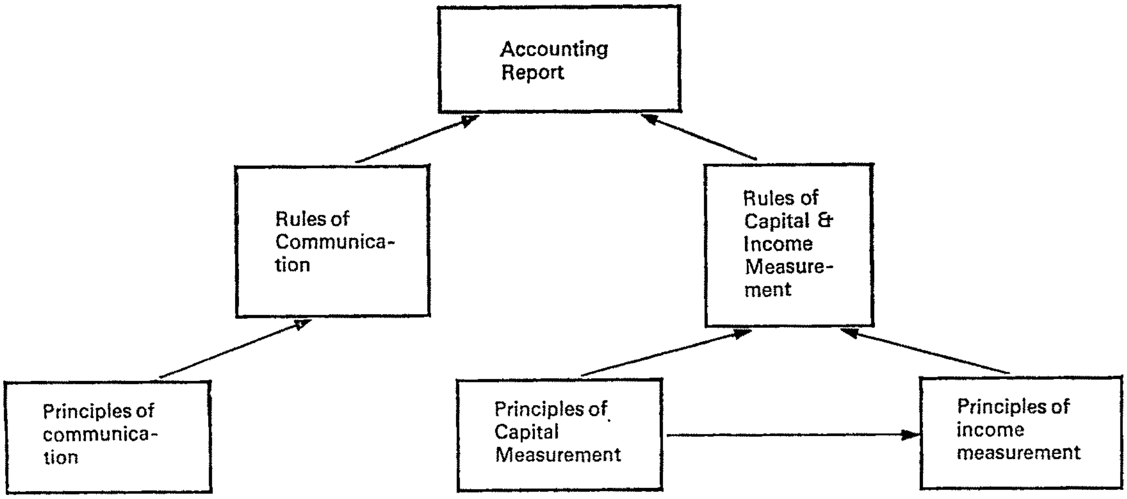

3.2.3 Historic Cost
3.2.4 Restated Historic cost
3.2.5 Replacement cost
Holding Gains and Losses
Alternatives in the measurement of cost
3.2.2 Realisation (for revenue recognition)
Adjustments to asset values in the measurement of capital not included in the matching process
3.2.1 Matching cost with revenue
Principles of asset valuation and capital measurement
Principles of income measurement
Economic results of operations (from basic descriptive postulate)

EXHIBIT 6
Principles, rules and the accounting report


Accounting Report
Rules of Communication
Rules of Capital & Income Measurement
Principles of communication
Principles of Capital Measurement
Principles of income measurement

The principles of communication will be used as a basis for setting workable rules of communication which may concern the form and presentation of reports, the nature and manner of preparation of basic and supplementary reports, methods and extent of disclosure, etc.

The principles of capital and income measurement will be used to set workable rules for the measurement of revenue; for accounting for price level changes, if it is agreed that this is desirable (e.g. what indices to use); for determining replacement cost and market values within the concepts of capital and income adopted. The rules may be subject to constraints imposed by the principle of realisation – or prudence.

The relationship between principle rules and accounting reports is illustrated in Exhibit 6.

Summary and conclusions

The objective of this paper has been to define an approach to the development of an overall framework of accounting theory based on internally consistent postulates and principles. A tentative set of postulates and principles has been suggested, at least by way of illustration. The starting point has been an examination of the accounting function. It is hoped that such a starting point will lead to the development of a theoretical framework of reference which is rooted in reality and which will therefore stand a good chance of general acceptance.

Central to the theory is the postulate of 'economic truth'. No attempt has been made to define 'economic truth'. To have done so would have given the theory a constrictive rather than a dynamic character. This is so because the definition would have had to be made within the context of the accounting knowledge and environment as at a particular point of time. The postulate is rather intended to provide a stimulus in the search for truth in a dynamic and changing environment. What is 'appropriate' accounting practice as at a particular point of time will give the practical substance of the term 'economic truth'. On the other hand the postulate of economic truth would require the continuous examination of current practice and as such would be a stimulus to change.

It has not been the objective of this paper to propose solutions to any specific accounting problems. Rather, the objective has been to outline a framework of reference for use in dealing with specific problems. It is the belief of the author that the proposed approach to the development of accounting theory goes a good way towards achieving this purpose. Although the starting point has been a description of the accounting function, the framework of reference which has been outlined is neither a description of accounting practice as it exists (or has existed), nor is it a confirmation of it. Rather the author believes that it has a built-in capability as a tool to assist in the evaluation of accounting practice and the formulation of accounting principles and rules.

An illustration of the application of the theory to a problem area in external reporting

It is proposed now to illustrate the application of the proposed theory to a problem area in external reporting – the problem of inter-period allocation of income taxes.

The following figures have been extracted from the 1968 accounts of a New Zealand company[11]:

	1968	1967
	$	$
Profit before taxation	116,967	462,126
Provision for taxation		228,000
	116,967	234,126

The notes to the accounts revealed that the company had claimed for tax purposes $315,867 in investment allowances and accelerated depreciation for which no entries had been made in the books. No tax was payable on the year's profits, and $198,900 was carried forward for taxation purposes against next year's profits.

Should the company provide for the loss of taxation advantages in the future?

The first point to decide is whether the relevant profit figure in the company report is the profit figure before or after tax. It is not proposed that one of these figures should be emphasised to the complete exclusion of the other. It could be argued, however, that as the liability for taxation is imposed by operation of law and cannot be avoided, the significant figure which shows the economic results of operations – e.g. the net increment to the economic resources of the company – is the net profit after tax.

If we agree to emphasise the net profit after tax, we would have to answer a second important question. The substantial deductions made by the company for tax purposes in 1968 would mean substantially reduced taxation allowances in future years with corresponding reductions in tax paid profit. The question is – can we say that we can truthfully disclose the economic effects of operations in 1968 (consistency with Postulate 2) without taking into account any significant reductions in future tax paid profits which may result from these events?

If the answer is 'no', then a company in such a position should be expected to provide for the loss in taxation advantages in the future.

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[11] The Dominion Fertiliser Company Limited of Dunedin.

It should be noted that the question of inter-period income tax allocation has been discussed not in relation to the nature of the taxation charge (e.g. whether it is a cost or a distribution of income) as has been usually the case, but in relation to the economic impact taxation has or is likely to have on current and future operating outcomes. It is believed that the latter approach provides a basis for a quicker solution to the problem.

It is also interesting to note that following a reasoning not unlike the foregoing, the company in question did decide to apply a form of income tax allocation in its 1969 accounts.

Acknowledgement. The author wishes to thank Professor T. K. Cowan of the University of Otago, School of Business for his encouragement in the development of this paper.

On the Measurement of Materiality

Benzion Barlev

Introduction

It is hard to overestimate the importance of the concept of materiality in accounting. The decision concerning what is material and what is immaterial can affect almost every aspect of accounting measurement and reporting. Conceptually, this decision contradicts the accounting rule of objectivity; practically speaking, the concept of materiality allows the accountant to use methods of reporting which deviate from generally accepted accounting principles.[1] The seriousness of this problem is also reflected in opinion No. 9 of the Accounting Principles Board *Reporting the Results of Operations*, which grants an important role to materiality especially with respect to the segregation of extraordinary items in the income statement and in the treatment of prior period adjustments.[2] This paper examines some alternative approaches to problems of materiality and sets out an operational model for measuring materiality, based on the item's impact on investor's decision.

Alternative approaches to materiality

The importance of the concept of materiality in accounting was recognised long ago. However, many notable accountants concluded that materiality is of 'such an elusive nature' that it is not useful to make any generalisations regarding this problem. 'Decisions on this point,' they stressed, 'call for exercise of the accountant's judgement in the light of each distinctive situation.'[3] The main deficiency of this approach, which relies on professional education and experience, is that it does not provide any benchmark for determining whether an item is material or not. Moreover, such an approach does not strengthen the image of the profession but rather weakens it, since it introduces subjectivity into the process of preparation of financial statements.[4]

Various attempts have been made to devise some objective guidelines for materiality. One approach has been to suggest quantitative dividing lines to distinguish between material and immaterial items. For example, the Securities and Exchange Commission, in Rule 1.02 of Regulation S–X defines a 'significant subsidiary' as one whose assets (sales and revenues) exceed 15 per cent of the consolidated assets (sales and revenues). The Accounting Principles Board, to cite another example, while discussing material dilutive effect has stated that, 'Any reduction of less than 3 per cent in the aggregate need not be considered as dilution in the computation and presentation of earnings per share data'.[5] Additional guidelines have been set for other items and for other purposes, but it is comparatively easy to point out the weaknesses of this approach. The most striking one is its arbitrariness. Why set the guideline at 15 per cent rather than 14 per cent or 16 per cent? How can we justify the claim that 3 per cent is different than 3·1 per cent? These and other points of criticism led Blough to conclude: 'Accountants have differing ideas as to the maximum or minimum percentage that might be used in applying the provisions of chapter 8 of Bulletin 43.[6] Some, for example, would not consider an item to be sufficiently material to be excluded from the determination of income unless it was in the neighbourhood of 20 to 25 per cent of the company's average net income over a period of years. Others believe there may be circumstances under which an amount as low as 10 per cent might be sufficiently material to justify exclusion'.[7]

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[1] The Committee on Accounting Principles and Procedures while discussing the authority of its opinion has stated: 'The Committee contemplates that its opinions will have applications only to items material and significant in the relative circumstances'. *Accounting Research and Terminology Bulletins*, (Final Edition, American Institute of Certified Public Accountants, 1961), p. 9. Its successor, The Accounting Principles Board has adopted the same point of view. See: Special Bulletin, *Disclosure of Departures From Opinions of Accounting Principles Board* (October 1964).

[2] Accounting Principles Board, *Reporting the Results of Operations*, Opinion No. 9. (American Institute of Certified Public Accountants, December 1966), especially paragraphs Nos. 17, 18, 21 and 23.

[3] Carman G. Blough, *Practical Applications of Accounting Standards* (American Institute of Certified Public Accountants, 1957), p. 222.

[4] For an elaborate discussion of this point, see Leopold A. Berenstein, 'The Concept of Materiality', *The Accounting Review* (January 1967), pp. 90–91.

[5] Accounting Principles Board, *Earnings Per Share*, Opinion No. 15 (American Institute of Certified Public Accountants, May 1969), p. 221, ff. 2.

[6] Chapter 8 of Bulletin No. 43 was superseded by APB Opinion No. 9, *Reporting the Results of Operations*.

An alternative approach suggests the establishment 'for each type of materiality decision, a centralised bracket with upper and lower limits to aid the accountant or auditor in reaching his primary decision on materiality'.[8] It is clear that the method of establishing the upper and lower limits (the 'border zone' in Berenstein's terms) is crucial for this approach. Woolsey suggested that the judgement of a sample of notable accountants be employed. Berenstein, on the other hand, tries to follow the decision making process of the informed investor. On the basis of a study of earnings growth rates in the US, Berenstein concludes that an extraordinary item of the size of 10 per cent can be deemed to be material. However, he recognises that this rate may change from period to period, and from one firm to another, and that there are situations where an item of a much smaller percentage would require disclosure because of its intrinsic significance.[9] Despite its shortcomings this approach has some advantages. 'It brings the border or cut-off point to the level of a concept and removes it from the numbers game,'[10] yet it still allows for the use of professional judgement. Moreover, the users of accounting information are assured that there exists a standard of reporting and that any deviation from this standard will be fully disclosed.

A completely different approach utilises concepts drawn from information theory.[11] Such an approach attempts to measure the loss of information that results from aggregation of various items in financial reports. While the idea is conceptually sound, given the current state of knowledge it is impractical, since it fails to measure the information loss relative to some decision model,[12] and since it requires a probabilistic interpretation of financial statements balances.[13]

In the next section, we shall suggest an alternative method for determining the materiality of items that have an effect on reported income using the impact on the decision making process as a benchmark.[14] Thus, a material item is one that can affect the decisions made by the users of the financial statements. While there are many users of reported financial statements, stockholders represent the largest and the most important group, so our discussion will focus on this group.

A model for determination of materiality

Following accepted financial theory, a decision to buy, sell or hold a certain stock is reached by comparing a stock's intrinsic value with its market price.[15] If an investor thinks that the intrinsic value of a share is greater than its market price he buys (continues to hold) the shares, if it is lower he sells his holdings and/or goes short in the stock in question. These statements, however, must be qualified. There are two additional factors that affect the decision process: transaction costs and the tax effect. It is quite obvious that the stockholder reaches a decision about a certain stock only after taking into consideration these two additional factors. A decision to sell stock, for example, will be reached only if the intrinsic value of the stock will be lower than its market price after transaction costs and taxes are taken into account. It follows that transaction costs and taxes serve as an institutional buffer against fast switches from one stock to another, and, therefore, these costs should be incorporated in a model for deciding whether an item is material or not.

Determining the intrinsic value of a share is not an easy task. Moreover, there is no agreement in the investment literature as to what constitutes the correct valuation model. Most of the students of this problem, however, do agree that expected income per share is a major determinant of stock prices,[16] and what is even more important, that investors regard reported income per share as one of the most important items of information when analysing stocks.[17]

Perhaps the valuation model most widely used by investors is based upon the notion that the value of an asset equals to its discounted future earnings:

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[7] Carman G. Blough, *op.cit.*, p. 223.

[8] Sam M. Woolsey, 'Judging Materiality in Determining Requirements for Full Disclosure', *The Journal of Accountancy* (December 1954), p. 750. The same approach is advocated also by Leopold A. Berenstein, *op. cit.*

[9] Berenstein, *op. cit.*, p. 94.

[10] Ibid, p. 93.

[11] See, for example, Henry Theil, 'On the Use of Information Theory Concepts in the Analysis of Financial Statements', *Management Science* (May 1969), and B. Lev, 'The Aggregation Problem in Financial Statements: An Informational Approach', *Journal of Accounting Research*, 6 (Autumn 1968).

[12] Y. Ijiri, *The Foundations of Accounting Measurement*, (Prentice-Hall, 1967), p. 121.

[13] I. Bernhardt and R. M. Copeland 'Some Problems in Applying an Information Theory Approach to Accounting Aggregation', *Journal of Accounting Research*, 8 (Spring 1970), p. 96.

[14] Such an approach was advocated also by Donald Rappaport, 'Materiality', *The Price Waterhouse Review* (Summer 1963), reprinted in Garner & Berg (eds.), *Readings in Accounting Theory* (Hougton Mifflin Co 1966).

[15] See, for example, Graham, Dodd & Cottle, *Security Analysis: Principles and Techniques* (4th edition, McGraw-Hill Book Co, 1962).

[16] See, for example, Graham, Dodd & Cottle, *op. cit.* and Lerner and Carleton, *A Theory of Financial Analysis* (Harcourt Brace & World, Inc, 1966), especially ch. 7, 8.

[17] This has been recognised also by the Accounting Principles Board. See, for example, Opinion No. 15, paragraph 2.

$$V_0=\frac{E_1}{(1+k_1)}+\frac{E_2}{(1+k_2)^2}+\cdots+\frac{E_n}{(1+k_n)^n}$$

where V_0 denotes the current value of the asset (the value of a share in our case), E_i represents the return from the asset in the *ith* period (earnings per share in our case), and k_i represents the appropriate discount rate in the *ith* period. It can easily be shown that where the investor extends his forecast far into the future (where $n\to\infty$), and where the return (E) and the discount rate (k) are constant, then $V_0=E/K$ or $V_0=mE$ where $m=1/k$ denotes the familiar multiplier.

For the marginal investor $V_0=P_0$ where P_0 is the share market price at the present time, thus in this case: $V_0=P_0=mE$. Since we know the share market price (P_0) and the current earnings per share (E), we can determine the multiplier (m).

Now let us assume that the accountant is faced with a question whether a prior years income adjustment item is material or not. We have noted earlier that the stockholder will change his decision about the stock (to sell, hold or buy) as a result of the inclusion (omission) of the adjustment item only if the value that it attributes to the stock is greater than the transaction costs. Thus, the accountant must compare the intrinsic value of the share as calculated with and without the prior years income adjustment item. If the difference is greater than the transaction costs, the item is material, since it influences the investor's decision process, and if the difference is smaller than the transaction costs the item is immaterial.[18]

Let V_1 = The value of the share calculated *with* the item in question.

V_2 = The value of the share calculated *without* the item in question.

TC = Transaction costs per share.

A = Prior years income adjustment item per share.

E = Earnings per share.

Our rule can be stated as follows:

if $|V_1-V_2|>TC$, the item is material
and if $|V_1-V_2|\leqslant TC$, the item is immaterial.

Since $V_1=mE_1$ and $V_2=mE_2$,
and since $E_1=E_2+A$
then $V_1-V_2=m(E_2+A)-mE_2=mA$.

We, therefore, can sum up our test as follows-

$$A=\begin{cases}\text{Material} & \text{if } mA>TC\\ \text{Immaterial} & \text{if } mA\leqslant TC\end{cases}$$

The value of the multiplier (m) is derived from the share market price and from the latest reported earnings per share: $m=P/E$, while the transaction costs per share can be obtained from any investment service, or from the *Stock Guide* published monthly by the Standard and Poor's Corporation. It is possible to use the above stated test to determine the upper limit of immaterial items:

$$A^*=TC/m\times\text{Number of outstanding shares}$$

where A^* represents the maximum size of an immaterial item.

Example:

Assume the following information about company X: The number of its outstanding shares is 800,000. Its latest reported income amounts to $600,000 or 75 cents per share and the market current price is $7.50 per share. The multiplier (m) is 10. Assume further that a prior years adjustment of income that amounts to $30,000 is being considered. How should this item, that amounts to 5 per cent of current earnings and that contributes some 3.75 cents to earnings per share, be dealt with? Is it a material item or not? From Standard and Poor's *Stock Guide*, we learn that the commission on a round lot of 100 shares of the stock in question amounts to $14.50 or 14.5 cents per share. When we plug the above information into our model, we get: $mA>TC$, since $10\times3.75=37.5>14.5$, and conclude, therefore, that the item in question is material. Moreover, we can also determine the maximum amount of an item that can be regarded as immaterial. In the case of Company X, $TC/M\times$ Number of outstanding shares, amounts to $14.5/10\times800{,}000=\$11{,}600$.

The advantage of the suggested approach is twofold: (*a*) the subjective decision process is converted into an objective one and (*b*) the model is operational. By this approach, materiality depends on the reported earnings per share, the market price of the stock and the transaction costs, all of which are available to the accountant and are independent of his subjective judgement.[19]

One possible objection should be noted. The market price of the shares – a major component of our model – constantly varies. This results in different guidelines for materiality. In a bull market, for example, where the price-earnings ratio (the multiplier m) is high, smaller items would be deemed material than in a bear market in which the price-earnings ratio is lower, since

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[18] For simplicity, we ignore taxes from our model. Essentially this means that there should be a much higher limit for immaterial items. In practice, however, it is impossible to find any criteria for adding the tax consideration into the model, because of the various tax brackets and because of the different tax treatment of regular income and of capital gains. Since most people are taxed at least at the rate of capital gains, we suggest, that by omitting taxes from our calculations we are applying the criteria of conservatism in determining materiality.

[19] The model assumes constant earnings but it can readily be generalised to cover growth situations as well, see, for example, M. Gordon, *The Investment, Financing and Valuation of the Corporation* (Richard D. Irwin, Inc, 1962).

$$A^*=TC/m \times \text{number of outstanding shares.}$$

However, this should be regarded an advantage of our model, since materiality reflects the same sensitivity with which investors evaluate reported earnings.[20]

Conclusions

It is clear that our model does not provide an ultimate answer to all the problems of materiality. It is rather limited to those problems that arise with regard to the income statement alone. It seems, however, that by following the logic that underlines our model – the idea that the determination of materiality should rely on the decision making process – we may be able to provide a more general solution to the problem of materiality.[21]

The objective of this paper has been to develop an operational objective guideline for determining whether an item of income is material or not. The model presented reflects the investor's decision making process. It uses transaction costs and price-earning ratio as its main components, as a result it permits a determination of materiality which does *not* depend on the accountant's judgement of the importance of the item in question.

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[20] This also means that decisions about material items should not be spread over the whole year but should be made at a point close to publishing date of the financial statements.

[21] We can for example, evaluate the loss of information in the process of aggregation by using acceptable ratios as our standards. It is interesting to mention, at this point, the case of *Escort* v. *BarChris Construction Corp* [283 F. Supp. 643, (SDNY 1968)]. In this case, the court concluded that earnings had been overstated by 14 per cent, a figure not deemed material, and that the current ratio was overstated by 16 per cent, a figure deemed material. The court did not explain why an overstatement of 16 per cent is material and that of 14 per cent is immaterial. It was suggested, however, that:

> 'A feature of the financial statements not discussed in the opinion tends to rationalise these conclusions. The effect of the balance sheet error was to exacerbate BarChris' violation of the 2:1 test of current ratio used by the financial community. In contrast, as the court observed earnings increased dramatically even without this overstatement'. Henry B. Reiling and Russell A. Tausing, 'Recent Liability Cases – Implications for Accountants', *The Journal of Accountancy* (September 1970), ff. 47.

Decision Oriented Financial Accounting

Robert R. Sterling

I. Introduction

The purpose of this paper is to consider the various measures (valuation methods) of wealth and income that have been proposed in the recent literature. A prerequisite to the consideration of that issue is the development of criteria by which the various measures are to be judged. I will review some of the major conflicts that have arisen about the criteria, state my reasons for selecting an overriding criterion and then attempt to show how that criterion can be applied.

II. Conflicting objectives

There are conflicting viewpoints about the objective of accounting reports. This conflict is rather difficult to detect. One must look closely for it. Almost all the literature on accounting states that accounting reports must be 'useful' or that accounting is a 'utilitarian art'. It seems that we all agree that the objective of accounting is to provide useful information. However, we discover conflicts when we examine the remainder of the 'basic concepts' of accounting. Consider the requirement that accounting data be objective and verifiable. It is possible for a measure to be useful even though it is not objective and verifiable. Thus, a conflict arises: Should we accountants provide useful data even if it is not objective, or should we provide objective data even if it is not useful?

There are many other conflicts. The particular terms that are used depend upon the author that one is reading. In regard to income, many authors begin their discussion with a remark about the need for providing useful information, but then they switch their attention to the realisation convention. It is possible that realised income is not the most useful measure of income. Thus, there is a conflict between realisation and usefulness. Other authors speak of the need to be conservative, and since it is possible for the most useful measure to be liberal, there is a conflict between conservatism and usefulness. Other authors note that a particular measure would violate the going concern assumption and reject the measure on those grounds without regard to the usefulness of that measure. And so forth for most of the other concepts of accounting. Each one of them may be set off against the notion of usefulness and be seen to be in conflict with it at some point.

Given the conflicts, we must decide which of the concepts is to be the overriding criterion. If we simply pay lip service to the notion of usefulness by allowing it to be constrained by all of these other concepts, then we are in fact denying the criterion of usefulness. Of course, if we can have our measures meet all of these requirements, then we are in the happy position of having no conflicts. The unfortunate fact is that they often are conflicting and we must decide which is the overriding criterion.

I think the overriding criterion should be usefulness. The other concepts are important but they are secondary. If, in order to make a decision, someone needs a measure of a particular property, then a rough guess at the magnitude of that property is useful. Of course, a precise, objective measure of that property is *more* useful, but the converse does not hold. If one does not need to know the magnitude of a particular property, then a measure of that property is useless no matter how precise and objective it may be.

Thus, I view accounting as a measurement-communication activity with the objective of providing useful information. Once we have discovered which properties are useful, then we must devise methods of measuring those properties. Hopefully, we can devise measurement methods which fulfil the requirements of objectivity, verifiability, etc. However, these requirements are secondary. They are desirable, but usefulness is indispensable. Therefore, providing useful information must be the primary objective of accounting.

III. Conflicting definitions of usefulness

Problems arise whenever we attempt to define the concept of usefulness. Like other hortatory concepts (e.g. truth, justice, fairness) everyone is in favour of usefulness in the abstract. All of us agree with Spacek's postulate of fairness. Who could speak out in favour of being unfair? The difficulty is in defining fairness. In the same way, the difficulty with 'usefulness' is in making its meaning precise enough to be applicable to a concrete situation. In an attempt to be more precise, I have in previous works[1] replaced 'usefulness' with 'relevance'.

The dictionary defines 'relevant' as 'bearing upon or relating to the matter in hand'. This is what I mean by 'relevant information', except that I substitute 'decision model' for 'matter in hand'. In the same way that one cannot determine what is relevant to the matter in hand without being aware of the matter in hand, I cannot determine what is relevant information without being aware of the decision model. One of the characteristics of a well defined decision model is that it will specify the measurement (or estimation) of certain properties. This allows my definition of relevance to be simple and straightforward:

> If a property is specified by a decision model, then a measure of that property is relevant (to that decision model). If a property is not specified by a decision model, then a measure of that property is irrelevant (to that decision model).

One conflict that has arisen is concerned with that definition. Several people have argued that we should focus on decision *makers* instead of decision *models*. They say that if decision makers want to know the measure of a particular property, then that property is relevant or useful. Some of them have run tests designed to determine whether or not people (decision makers) use certain kinds of accounting data. When they found a certain kind of data being *used*, they concluded that this data was *useful*. They argue that we should supply the decision makers with the kind of data that they want and that this is the end of question of relevance.

At first glance this view is rather appealing. In the same way that we give the voter and consumer a free choice, so the argument goes, we should give the decision maker a free choice. Thus, the argument is stated in terms of democracy or consumer sovereignty, and it is difficult for anyone to be against democracy. At the risk of making you think that I am a dictator, let me briefly outline my reasons for being opposed to this view.

(1) In the present system, the decision maker can either use the accounting reports that we give him or make his decision in the absence of that information. His choice is to use or not use our data. There is no third alternative.[2] If we were to adopt my suggestions for changing the kind of data to be included in accounting reports, the decison maker would have the same choice. Therefore, the adoption of my suggestions would be equally as 'democratic' as the present system. The only difference would be in the kind of data being reported.

(2) Decision makers are a diverse lot. They make their decisions on a wide variety of different bases. We have all heard about people who trade the market on the basis of astrological signs or arthritic pain. 'Technical analysts' on Wall Street trade the market on the basis of the 'flags', 'heads and shoulders' and 'double bottoms' they see in their charts. Given this diversity, it is an economic, if not a physical, impossibility for us to supply *all* the information that *all* decison makers want. Therefore, we must select and in the process of selection, we will fail to satisfy the wants of some decision makers. What we are arguing about then is the *basis* for selection.[3]

(3) The basis for selection that I prefer is to supply information for rational decison models. The modifier 'rational' is defined to mean those decision models that are most likely to allow decision makers to achieve their goals. Since I don't believe that astrology allows people to achieve their stated goals, I am not interested in supplying them with an astrology report even though they use that kind of information in trading the market. For the same reason, I am not interested in supplying decision makers with some of the kinds of data now being

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[1] Robert R. Sterling, *Theory of the Measurement of Enterprise Income* (The University Press of Kansas, 1970), pp. 50, 132, 354, *et passim* and 'On Theory Construction and Verification', *The Accounting Review*, July 1970, p. 454.

[2] This is the basis for a technical criticism of the tests that have been run to see if decision makers use accounting data. Most experiments require a 'control' of some kind. The tests would have more force if the decision makers were offered a choice between using accounting data and using some kind of control data. To put it another way, suppose we ran a test in which decision makers could choose either (1) zero information or (2) x information. I suspect that the decision makers would choose x information. A more powerful test would be to offer them the choice between x and y information.

[3] Section II was, in effect, an argument about the basis for selection. That is, it was an argument against excluding data on grounds of objectivity, realisation, etc. Thus, accountants are *now* being selective in the kind of data that they report. Indeed, they must be selective since no information system can report everything. The pertinent grounds for argument then must be the basis for selection and it is impertinent – the commission of the fallacy of alleging a non-existent difference – to argue on the grounds that one information system is selective (dictatorial) and another is not.

included in accounting reports even though they use that data.

The above is only a rough sketch of the conflict. I have gone into some other aspects of the problem elsewhere.[4] Although there are a good many scattered remarks in opposition to this view, insofar as I know, there is only one article devoted exclusively to the problem.[5] As I have said before,[6] I believe that the proponents of the decision maker view have overlooked the distinction between pragmatic and semantic information. Pragmatic information is defined by the receivers' reaction to the report. For example, if I yelled 'Fire' and all of you ran to the exits, my report would be said to contain pragmatic informational content. Semantic informational content is concerned with the connection of reports to objects and events. For example, if there were a fire, my report would be said to contain semantic informational content. If there were no fire, it is semantic misinformation, or in plain English, a lie. Note that the two kinds of information are separable and that one kind does not imply anything about the other. Of course, we accountants know this from harsh experience. Everybody agrees that decision makers used the McKesson-Robbins financial statements and therefore there was pragmatic informational content. The problem was the absence of the inventory and therefore the presence of semantic misinformation.

Although many of my critics agree in principle with the decision model approach, they throw up their hands in despair at the prospect of trying to apply it. There are a great many different kinds of decision models, e.g. EOQ, PERT, Linear Programming, Capital Budgeting, etc. Such decision models are applicable to only certain kinds of decisions, e.g. inventory ordering, scheduling, allocations, investments, etc. In addition, there are a great many choice criteria that are used in reaching decisions, e.g. minimax, maximin, Hurwicz, least regret, etc. Thus, we have a great variety of decision models applicable to a variety of decision situations with a variety of proposed criteria. It appears to be impossible to set up a general information system or to design a set of general purpose financial statements which would meet the requirements of all these models. An even more difficult problem arises whenever we encounter decision situations for which there is no well defined decision model.[7]

The trick is to generalise – to try to capture the elements that are common to all decisions. Although such a generalisation, like all other generalisations, leaves out many important details, it allows us to get a handle on the problem. Let me attempt such a generalisation. All decision models require information about:

1. Alternatives $=A=\{a_1, a_2, \ldots, a_n\}$
2. Consequences $=C=\{c_1, c_2, \ldots, c_n\}$
3. Preferences $=P=$ a function for ordering consequences.

Alternatives (or possible courses of action) must be presently feasible. There is no point in choosing a course of action that is not feasible. One may plan what he will do if and when an alternative becomes feasible or he may ruminate about past alternatives, but the choice is always restricted to the alternatives that are feasible at the time of the decision – the present. The alternatives must be competing in the sense that the selection of one obviates the selection of the other, and hopefully, the list would completely specify all alternatives. If alternatives are not competing, then no decision is required. One need not choose between x and y if one can select both x and y. If the list is not complete, then one may not know about the existence of a preferred alternative. Thus, a decision maker is faced with a set of alternatives, the elements of which are mutually exclusive and exhaustive. The decision maker may contemplate a broad range of possible courses of action but he must select from 'alternatives' – those courses of action that are available to the decision makers at the moment of choice.

Consequences (or outcomes or payoffs) of the alternatives lie in the future. They must be predicted. The consequences may be stated in terms of certain uncontrollable events, and then probabilities assigned to the uncontrollable events. For example, one can predict that if a_i is selected the consequence will be c_i^1 if event x_1 occurs, c_i^2 if event x_2 occurs, etc. By assigning probabilities to events, $x_1, x_2, \ldots$ and aggregating $c_i^1, c_i^2, \ldots$ one can speak of 'the' consequence, c_i, associated with a_i.

Preferences are personal. Even though different decision makers are faced with the same alternatives and they predict the same consequences, they may make different decisions. This may come about from different assignments of probabilities or different choice criteria of different utility functions or simply the inexplicable choice of the decision maker. I include such things under the category of 'preferences' and in the present state of the art they are 'matters of taste' that are personal to the decision maker. Given the one to one correspondence of alternatives and consequences, the preference for a given consequence uniquely determines the alternative to be selected.

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[4] Sterling, *Enterprise Income*, pp. 54–61.

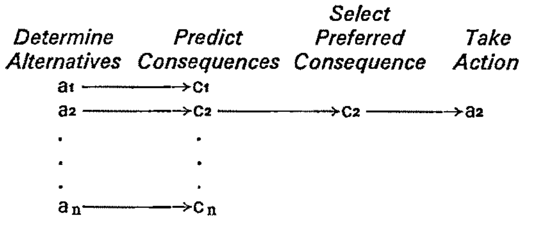
[5] A. Rashad Abdel-khalik, 'User Preference Ordering Value: A Model', *The Accounting Review*, July 1971, pp. 457–71.

[6] Sterling, 'Theory Construction', p. 453.

[7] See Robert R. Sterling, 'A Statement of Basic Accounting Theory: A Review Article', *Journal of Accounting Research*, Spring 1967, p. 107.

A summary of the decision process is shown in Figure 1.

FIGURE 1
The Decision Process



Decision models are abstractions which are separate and apart from decision makers. For example, the EOQ model is an idea which can be thought about separately from the persons who hold or use that idea. It is the decision *model* that requires information about alternatives, consequences and preferences. The decision maker can be thought of as a supplier of information to the decision model. Consider Figure 2.

The accounting system is also a supplier of information, but it is not necessary for it to supply all of the information required by the model. In non-feedback situations, such as providing financial statements to investors, it is impossible for the accounting system to provide information about the preferences of the decision makers. Since the decision makers already know their preferences, the point may seem to be unimportant. However, there are many accountants who have become bogged down in their efforts to design an information system because they were unable to specify the decision maker's utility function or because there were several different decision makers with different utility functions. If we view the decision maker as the supplier of this kind of information to the decision model, then this problem is by-passed, if not solved. The accounting system could then concentrate on supplying information which would aid in defining alternatives and predicting consequences.

In summary, an accounting system should be designed to provide relevant information to rational decision models. The accounting system cannot supply all the information desired by all decision makers and therefore, we must decide to exclude some kinds of information and to include other kinds. Restricting the decision models to rational ones permits the exclusion of a raft of data based upon the whims of decision makers. It permits us to concentrate on those models that have been demonstrated to be effective in achieving the decision makers' goals. Information specified by decision models may be classified as alternatives, consequences and preferences. Excluding information about preferences, on the grounds that the decision makers already possess this information, permits us to concentrate on supplying information concerning the definition of feasible alternatives and the prediction of consequences.

IV. Conflicting valuation methods

Although we sometimes attempt to separate the question of how to value assets from the question of how to measure income, the two are, in fact, inextricably entwined. This is indicated by the fact that we often say that our financial statements 'articulate'. It is even clearer whenever we consider the basic accounting equation.

(1) $A=L+P$

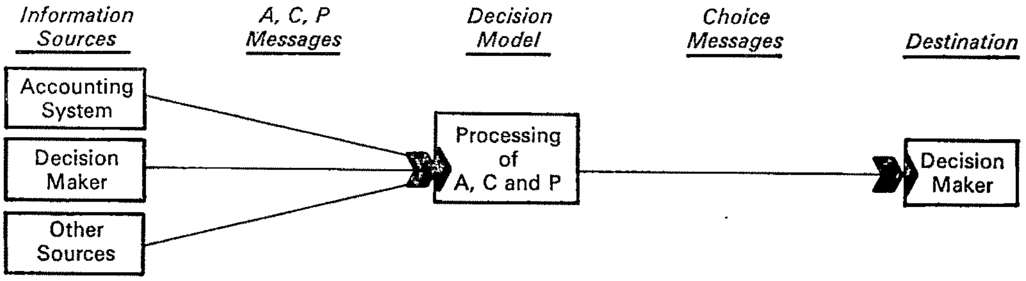
Almost every elementary accounting textbook has a problem which is concerned with the determination of income by utilising this equation. They assign a time index (t_i) and state the proprietorship as a residual.

(2) $A(t_i)-L(t_i)=P(t_i)$

Then the income (neglecting investment and disinvestment) for the period t_i to t_{i+1} is given by (3).

FIGURE 2

Information System



(3) $P(t_{i+1})-P(t_i)=Y$

It is obvious that if the assets take on different values, then the income for the period will take on different values. For example, a switch from straight-line to accelerated depreciation or from FIFO to LIFO will affect both the reported asset values and the reported income. The same is true if we state the assets at their historical cost as opposed to, say, current market value. Thus, when one talks about different methods of valuation, and the conflicts between them, then one is also at the same time talking about conflicts in income measurement.

There are four major valuation methods that have been proposed in the literature:

(1) historical cost (HC),
(2) replacement cost (RC),
(3) exit values (EV), and
(4) discounted cash flows (DCF).

Some people have argued that price-level adjusted historical costs should be listed as a fifth valuation method. However, one could adjust each of the above methods for changes in price-levels and thereby add a total of four more methods. I am in favour of price-level adjustments, but I think that the selection of a valuation method is a separate problem. We must first select the valuation method(s) and *then* we can consider the necessary adjustment for price-level changes. Therefore, I will neglect the problems of price-level adjustments in this paper and concentrate on specific price changes.

The incomes that result from applying these valuation methods have been called

(1) realised income,
(2) business income,
(3) realisable income, and
(4) economic income.

All of these names are somewhat inaccurate. Some economists would say that 'realisable income' is 'economic income' and therefore, they would object to the names that we have used. 'Historical cost' is somewhat inaccurate in that there are many assets on the balance sheet that are not valued at cost, e.g. cash and accounts receivable. 'Realised income' is somewhat inaccurate as, for example, when the percentage of completion method of revenue realisation is used. In addition, these methods sometimes borrow from one another. For example, HC sometimes uses DCF in accounting for bonds or notes. In the same way, some of the authors who propose, say, EV will occasionally revert to either RC or HC. Thus, none of the methods are pure. Finally, there are different procedures within each of the methods. Just as income may be calculated by using either LIFO or FIFO, and both of them referred to as 'realised income', there are different procedures within the other methods. I will not attempt to discuss all of these exceptions and differences; instead, I will concentrate on describing the major differences among the methods.

All four valuation methods use a price of some kind as the basis for valuing, but each method endorses a different price. The endorsed prices differ by their temporal location and by the market in which they are found. Both HC and RC use the prices found in the purchasing market. They differ only in the temporal location of those prices. A past (time of purchase) price is used in HC while a present (time of statement preparation) price is used in RC. Thus, except for the temporal location of the prices, RC is identical to HC. EV, by contrast, focuses on the present (time of statement preparation) prices in the selling market. EV is similar, but not identical, to the 'net realisable values' used in HC in applying the lower of cost or market rule to inventories.

DCF uses both purchase and selling prices, but it focuses on the future – the prices that will be in effect at the time of future exchanges. DCF is similar to the 'present value method' of accounting for bonds used in HC. In DCF the cash receipts from the future sale of the products and the cash expenditures for the future purchase of the factors of production are predicted and then discounted to get 'present value' or 'present worth'. Hereafter, I will substitute 'discounted value' for 'present worth' to avoid confusion.

These differences are summarised in the following matrix.

Time Market	*Past* *(Purchase)*	*Present* *(Statement Preparation)*	*Future* *(Exchange)*
Purchasing	HC	RC	DCF
Selling		EV	DCF

The differences in income may also be described in general terms. The revenues (asset inflows from sales) would be the same for all four methods, but the amount charged to expense would differ considerably. We all know how the allocations are made in HC. RC uses the same allocation techniques, but it costs out the quantities at their current purchase prices. The argument is that we should match current costs with current revenues and thus the line of reasoning is the same as that of many LIFO proponents. However, unlike LIFO, RC also uses current purchase prices on the balance sheet which results in including 'holding gains' (also called 'cost savings') in income. EV looks to the market to determine the expenses. Initially, the expense is the difference between the purchase price and the exit value at the date of statement preparation. Subsequently, it is the difference in the exit values at two statement preparation dates. Both HC and RC are *allocations* (amortisations) of a purchase price on the basis of use or sale or passage of time. EV attempts to avoid the allocation problem by going to the market to determine how much the asset could be sold for. The decrease (increase) in the amount it could be sold for is the amount of the cost (gain) of using or holding that asset.

DCF recognises a gain at purchase equal to the difference between the discounted value of the products produced by the acquired asset and the face value of the cash sacrificed. The amount of the subsequent income is simply the interest earned (the interest rate times the discounted value) in exactly the same way that interest income is the yield rate times the discounted value of bonds receivable in HC. Adjustments are required in DCF whenever events are different from those predicted. These adjustments present problems similar to those encountered in HC when, say, the actual life of an asset is different from its predicted life.

There are many arguments in favour of and in opposition to all of these valuation methods. However, the proponents of the various schools rely most heavily on the usefulness or relevance criterion. Each school claims that its particular valuation method would be more useful than the others. For this reason, and also because I believe that usefulness should be the overriding criterion, I will ignore the other criteria and try to select the appropriate valuation method by applying the criterion of relevance.

V. Application of the relevance criterion to market decisions

Although there are a good many decisions that do not involve a market exchange, in a market economy such as ours probably a majority of decisions are concerned with whether or not to make an exchange in the market. The market operates with prices, and since the conflicting valuation methods differ mainly in their endorsement of certain prices, a general consideration of prices and market decisions is pertinent to the conflict.

Market alternatives

The market alternatives that are available to any person or any firm depend upon two factors:

(1) The funds that are currently available to invest in the contemplated project.

(2) The magnitude of the investment required to engage in the contemplated project.

Specifically, the funds available for a given project must be greater than or equal to the investment required for that project. Otherwise, that project is not a feasible market alternative.

Although this point is obvious, I wanted to make it explicit in order to demonstrate that 'profitability' is *not* the first nor the sole criterion for selecting projects. There are many projects which I think would be very profitable, but I cannot undertake them because my available funds are less than the required investment. For example, I would like to purchase General Motors, but since my available funds are less than the purchase price this is not a feasible alternative for me.

Market consequences

The market consequences of undertaking a given project are the future cash flows that result from that project. There may be non-market consequences which the decision maker should consider (e.g. one may be sent to jail for engaging in an illegal project or one may get satisfaction from beating the competition), but I will concentrate on the market consequences. Since these cash flows lie in the future, they must be predicted.

Preferences

The decision maker is faced with an array of future cash flow magnitudes. He must select one of those magnitudes by applying his personal preference function. He may do this by converting the money magnitudes to utility magnitudes, assigning subjective probabilities to the flows under varying conditions, and utilising one of the various choice criteria. Such information is to be supplied to the decision model by the decision maker because it is a matter of personal preference.

In addition, the discount rate should be supplied by the decision maker because each decision maker is likely to have different needs for liquidity and different views on the time value of money. That is, people are likely to have different 'reservation rates' and these rates are likely to be different from the cost of capital rate of the firm. For this reason, I will distinguish 'future cash flows' (FCF) and 'discounted cash flows' (DCF) henceforth.

After appropriate adjustment for risk, I would select the project with the largest cash flows. That is, I am a maximiser. However, that is a personal preference and there may be some who have different preferences. The above discussion does *not* depend upon the assumption of profit or wealth maximisation for its validity. If one wants to minimise he can be a more efficient minimiser by following this general outline for decisions.[8]

The main point about preferences is that, as before, they are to be supplied to the decision model by the decision maker. Therefore, in the following discussion I will concentrate on supplying information about alternatives and consequences.

Price interpretation

The market alternatives and consequences have been defined and the preferences have been left to the decision makers. It is now necessary to give these alternatives and consequences a price interpretation. Recall that the market alternatives depend upon the available funds and the required investment. In turn, the available funds depend upon:

(1) The present selling prices of all assets held, including the 'selling price' of cash.

(2) The ability to borrow.

(3) The ability to raise equity capital.

I will consider (2) and (3) *infra*. In regard to (1), note that the present selling prices are the only prices relevant to defining the available funds. Past prices are irrelevant, because they are no longer obtainable and future prices will be relevant to defining future alternatives, but they are irrelevant to defining the current alternatives. Purchase prices are obviously irrelevant if one is trying to determine how much cash he can get if he sells.

The required investment is given by:

(1) The present purchase prices of assets *not* held.

(2) The present selling prices of assets held.

Obviously, if one is contemplating the purchase of an asset, then the present purchase price of that asset is relevant to the determination of whether or not the alternative is feasible. The investment required for maintaining the status quo, however, is given by the selling prices of the assets held. Since the individual or firm already holds the assets necessary to maintain the status quo, then there is no need to contemplate their purchase. Instead, the (implicit) required investment is the amount of cash that one could get if one sold those assets. That is, the decision not to disinvest is structurally identical to the decision to invest, and therefore, the required investment for continuing the status quo is the amount of cash that was not received by not disinvesting.

The future cash flows require a prediction of the future selling prices of the outputs of the project as well as the quantities that will be sold. The future selling prices of the inputs are also relevant. That is, the salvage values of productive assets at the termination or abandonment of a project are future cash inflows and are, therefore, relevant. If a project requires future replacement of productive assets or the purchase of the factors of production, then the future purchasing prices of the inputs are also relevant.

The decision requires the comparison of the future cash flows of each project. Other things equal, the decision maker can make his selection by scanning the array of future cash flows and applying his preference function. However, in this case other things are seldom equal. Usually, the required investments are not of equal magnitude. If the projects have unequal required investments, it is not possible to make a rational decision by considering only their future cash flows. One project may have large cash flows but an even larger required investment. A common method of overcoming this difficulty is to calculate the rate of return on the required investment and then compare the rates of return. Note that this method is a comparison of the required investment to the future cash flows, i.e. rate of return is the time adjusted quotient of the future cash flows and required investment. In general, whenever required investments are not equal one needs to compare the required investment to the future cash flows.

The above is simply a generalisation of the capital budgeting model, absent an explicit consideration of discounting. The capital budgeting model specifies the prediction of future cash inflows and outflows, and then the time adjusted net flows of the various projects are compared to one another or to the required investment. Since the capital budgeting model is usually applied to new projects, we tend to forget that it is also applicable to existing projects. Sometimes our predictions are wrong and sometimes we change our predictions after initiating a project. For this reason, existing projects should be re-evaluated periodically. In this re-evaluation, the decision model specifies a comparison of the *updated* prediction of cash flows to the *present* required investment. That required investment is given by the selling prices of assets held. Obviously, if one wishes to maximise, he should discontinue a project and sell the assets if the future cash flows are less than the sum of the selling prices. Just as in the case of a new project, a maximiser should not commit the required investment if it is greater than the predicted cash flows. In the case of an existing project, the required investment is the sum of the present selling prices of the assets.

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[8] This point should be underscored because several people have criticised my previous works for assuming profit maximisation or postulating an economic man. In the above classification scheme, the goal of the decision maker is included in the category of preferences. A maximiser's preferences will cause him to select a consequence different from the one selected by a minimiser. A satisficer will cease searching for additional alternatives whenever he has found a satisfactory consequence. Regardless of the goal, an accounting system which provided information about alternatives and consequences would aid the decision maker in achieving that goal. Of course, decision models are not usually designed to minimise, but that is simply an indication that few people are minimisers and that most minimisation problems are trivial. For example, a linear programming model could be used to search for the lowest profit-highest cost solution by simply altering the objective function, but a minimiser could more easily achieve his goal by considering the consequences of selling his product at a negative price or by burning his plant.

In summary, a rational market decision model specifies the following prices:

(1) The present selling prices of all assets held because

(*a*) when compared to (2), they define the feasible market alternatives, and

(*b*) they completely define the investment required to maintain the status quo.

(2) The present purchase prices of all assets not held because

(*a*) when compared to (1), they define the feasible market alternatives, and

(*b*) they completely define the investment required for new projects.

(3) The future purchase and selling prices associated with a given alternative because when compared to the required investment [(1*b*) or (2*b*)], they permit a rational decision.

Creditor and investor market decision models

The above analysis is general. In addition to managerial decision models it is also applicable to creditor and investor decision models. Each creditor and investor must determine the feasible alternatives by comparing the available funds to the required investments. The available funds are defined, as before, by the selling prices of the assets held (by the creditor-investor) and the ability to borrow or raise equity capital. That is, investors borrow and creditors issue equity shares, and therefore, the funds available to them are determined in exactly the same way as outlined above. The required investment for new projects is the amount of the loan application or the present purchase price of the stock. For existing projects, the required investment is the present selling price of the debt or equity instrument.

The creditor-investor decision model also calls for a comparison of the required investment to the future cash flows. In this case, the future 'selling prices' of the 'output' is the interest or dividends. The 'salvage value' is the maturity or liquidation value of the instrument. Since the project may be abandoned or aborted prior to the maturation of the debt or liquidation of the firm, the salvage value may be a future selling price of the instrument.

In short, the investor-creditor decision model specifies exactly the same prices as those given above. However, these prices refer to assets held *by the creditor-investor* and to the various prices *of the debt-equity instrument.* Strictly speaking, this is *all* that the creditor-investor needs to know. That is, after an investor has narrowed the stocks down to those that are feasible alternatives, the only thing he needs to know is their purchase prices and their future selling prices (including dividends) *in the stock market.* He can then compare and make his choice(s).

If the creditor-investor can predict these future prices without regard to the operations of the individual or firm to whom he is lending-investing, then we need go no further with this analysis. Many investors do not look beyond the securities market when they make such predictions. They act as if the price fluctuations in the stock market were completely independent of the economic fluctuations of the firms that issue the stock. If this is true, then the stock market is simply a lottery with no underlying economic meaning, and we accountants should quit wasting our time and paper by issuing financial statements. Instead, we should draw the income numbers out of a hat and thereby determine who has won and lost. However, I, personally, am not interested in the stock market qua lottery. I believe that stock prices (as well as dividends, interest and ability to repay loans) do in fact depend upon the economic conditions of the firms. Moreover, I believe that stock prices *ought* to depend upon the economic conditions of the firms and that if we accountants supplied better information about the firms, the stock prices would conform more closely to those conditions. In short, I believe that a well designed investor-creditor decision model should specify information about the states and operations of the firms. I am not trying to dictate to investors. If they want to trade the market by 'reading the tape', then that is their business. If they can be successful on that basis, then more power to them. However, I believe that information about the firms should be available to investors, whether they use it or not. For all these reasons, I will concentrate upon the information specified by a rational creditor-investor decision model and assume that other information about the market will be supplied from non-accounting sources.

Future cash flows of the firm. The ability of a firm to service a debt, pay dividends or simply to survive depend upon its future cash flows. Thus, the future cash flows of a debt-equity instrument depend upon the future cash flows of the firm. It follows that the future cash flows of the firm are relevant to the creditor-investor.[9] The creditor-investor may make his own predictions of the flows or be supplied those predictions by someone else. The predictor may assign probabilities to the completion of the project and the abandonment of the project and predict the cash flows under both conditions. Many other refinements of this kind could be listed. The only point that I want to make is that the future cash flows of the firm are relevant to the investor-creditor, because the future flows of debt-equity instruments depend upon them.

I would urge that the prediction of the future cash flows used by the creditor-investor be independent of the prediction made by the management. This is not to impugn the honesty of managements, but rather to note that managements are likely to be optimistic about their own projects. If they were not, they would not have proposed them. Thus, an independent prediction is called for. This means that, as a minimum, the creditor-investor needs to know *which* projects are planned by management. Then, the creditor-investor (or his agent) can independently assess the probability of success and independently predict the future purchase and selling prices of the project, as well as applying his personal discount rate.

Selling prices of firm assets. Whenever someone lends, invests or purchases, he is acquiring some value that exists now as well as some values that are predicted to exist in the near and distant future. The presently existing values can vary from zero to 100 per cent of the purchase price. For example, if I 'purchase' a ten dollar bill with two fives, then the presently existing value of the ten is 100 per cent of the purchase price. Moreover, the ten will not increase in value in the future. On the other hand, if I grubstake a miner in return for a share of his find, then the presently existing value is zero – *all* of the value that I have purchased lies in the future. That future value may be much greater than $10, or it may be zero. Obviously, grubstaking a miner is much riskier than purchasing a ten dollar bill. This risk relationship of the presently existing value to the purchase price is true in general. The smaller the presently existing value in relation to the purchase price, other things equal, the higher the risk.

This means that the present selling prices of the assets held (and the selling prices that will exist immediately after purchase) are relevant to the decision. Perhaps the point in regard to an investor can be made clear by considering mutual funds. Suppose you have the option to purchase one share of either the L or the N fund for $100. Now the managers of both funds would promise you the moon if the SEC would let them get by with it. Therefore, you ought to make an independent prediction of the future 'performance' of both funds. Suppose you predict that the selling prices x years from now will be $140 and $120 for the shares of the L and N funds, respectively. Without further analysis, you can make your selection. If you are a maximiser, you will select the L fund. However, let me add two facts and then see if you agree that these facts should be specified by a well-designed decision model.

The L fund is a load fund and the amount of the load is $90. The N fund is a no-load fund. That is, the per share exit value[10] is $10 for the L fund and $100 for the N fund. Therefore, the value of the assets held by L must increase by 1,300 per cent to reach the predicted price while the increase required by N is only 20 per cent. Almost all of the value of L lies in the future while most of the value of N exists presently. Other things equal, L is a much riskier investment.

As many people have correctly pointed out, one should go ahead and buy a load fund if one thinks that it will out-perform a no-load fund by more than the amount of the load. However, the amount of the load is relevant to a well-designed decision model. This amount is determinable if the present selling prices of the assets held are disclosed.

There is also a 'load' or 'premium' on the price of the stock of industrial firms. The price of some stock is several hundred times its per share exit value. In such cases the purchased value lies almost wholly in the future. Other things equal, the greater the portion of the value that lies in the future the higher the risk. That is, if the firm does not perform in accordance with expectations the price of the stock is likely to drop drastically. By contrast, some stocks sell at a 'discount' – the price of the stock is less than its per share exit value. Closed-end funds, for example, often sell at a discount. The future price and dividends of discounted stock still depend upon the future cash flows of the firm, but, other things equal, it is much less risky. The value presently exists and therefore even if the firm liquidated immediately the investor would not lose. Indeed, he would profit.

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[9] Again, there are many other factors that are relevant, such as the 'character' of debtors and the 'resilience' and 'ingenuity' of management. However, I will focus on the more immediate market factors.

[10] The sum of the present selling prices of the assets held by the fund less the liabilities divided by the number of shares outstanding.

Therefore, I conclude that the magnitude of the discount or premium is relevant to a well-designed decision model. That accountants know this is evidenced by their lower of cost or market rule. Although formally applicable only to inventories, it is also applied to a great many other assets. For example, I know of a case where the auditors insisted upon writing the value of land down to 'fair market value', even though they knew that this write-down would be likely to result in the liquidation of the firm. The land had been purchased at a price which reflected the expectation of mineral deposits which had failed to materialise. The auditors evidently thought that the 'fair market value' (exit value?) of this land was relevant to investors and creditors.

The problem is that this is a one-way rule. I know of another case where the stock of a retail chain is selling at about $10 per share. Based on its poor earnings, this is a reasonable price. That is, if it continues in the future as in the past, its future cash flows will be meagre and its reported income even less. However, this firm owns the land upon which its stores are built and the per share exit value of the land alone is conservatively estimated to be $40 per share. This land is carried on the balance sheet at its ancient historical cost of about 20c per share. I believe that the exit value of that land is equally as relevant in this case as in the above case.[11] If the *Gerstle* v. *Gamble* case[12] is taken as evidence, it appears that the SEC also believes that exit values are relevant to investors.

Although these cases are extreme, they illustrate the fact that the price of stock ought to depend upon the presently existing exit values of the firm as well as depending upon the future cash flows of the firm.

I have spoken only of investors above because creditors have long recognised the relevance of the selling prices of assets. They are usually willing to loan only at a discount. That is, if a particular asset is pledged, they are willing to loan only a fraction of that asset's selling price. If they are general creditors, they are willing to loan only a fraction of the conservative (lower of cost or market) value of the total assets. Of course, creditors also look to the future cash flows of firms, if for no other reason than that they would prefer to avoid the expense of foreclosure. However, the selling prices are also relevant to them and they explicitly recognise the risk relationship when they speak of the amount of the discount or the amount of the net worth as providing a 'cushion of safety'.

VI. Implications for wealth and income measurement

If the above analysis is correct and complete, then the implications are fairly straightforward. We noticed that

(*a*) Present selling prices (EV) of assets held by the firm,

(*b*) Present purchase prices (RC) of assets not held, and

(*c*) Future cash flows (FCF) of the firm

are relevant to well-designed market decision models of managers, investors and creditors.

Conspicuous by their absence from this list are past purchase prices (HC). I do not find them specified by any market decision model, and therefore, I conclude that they are irrelevant. This is a conclusion that I have held for many years and one that I have spoken about and written about many times. On one occasion, I challenged all readers to demonstrate just one case where historical costs were relevant to economic decisions.[13] It has now been five years since that challenge was made, and no one has published a direct reply. Since then, several people have argued for historical cost on the grounds of objectivity, feasibility, etc. This is the reason why I said in Section II that there were conflicting views on the objectives of accounting. Other people have argued for historical costs because managers, creditors and investors do, in fact, use the financial statements that we give them. However, the fact that they use HC does not indicate that they would use HC if other information were supplied or that they ought to use them, in the sense that other information may be more likely to allow them to achieve their goals. This is the reason why I discussed the conflict between decision makers and decision models in Section III. If we really mean it when we say that accounting data should be useful or relevant, then we should demonstrate the relevance of HC or the superiority of HC to other valuation methods, and if we cannot do that, then we should abandon HC as a valuation method.

I exclude present purchase prices (RC) for a different reason. Present purchase prices of the assets *not* held are relevant to market decisions models. The source of information about these prices is the market itself, and they are already being supplied to management by the purchasing department. Financial statements report on assets held, and since present purchase prices are not relevant to assets held, they should not be used as a basis for the valuation of assets on financial statements.[14]

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[11] The only reason why I don't buy all the stock and liquidate the firm is that I lack the required investment of $10.00 per share for over two million shares.

[12] *Gerstle* v *Gamble-Skogmo*, 298 Federal Supplement 66 (1969).

[13] Sterling, *ASOBAT Review*, p. 111.

Every decision requires a prediction of the future consequences of various alternatives. For this reason, if I thought it were possible, I would urge that accountants report future cash flows. Knowledge of the future is always the most valuable kind of information. The reason it is so valuable is that it is so scarce. We have no way of knowing what the future holds, and there are many conflicting views about it. The existence of these conflicting views of the future partially makes the market operate. Except for specialisation and liquidity requirements, there would be no market if buyers held the same view of the future as sellers. This is most obvious in the commodity markets, where there is a long for every short. The speculators hold diametrically opposed views of the future – the long (buyer) expects a price increase and the short (seller) expects a price decrease. One of them must be wrong. The same thing happens in varying degrees in other markets. Thus, differing predictions of the future are an inherent part of the operation of a market.

It is this difficulty which causes me to reject the notion that accountants ought to report FCF. First, we cannot report FCF, we can only report predictions of FCF. If we were perfect predictors, we would destroy the market, i.e. prices would be set equal to the discounted value of the future cash flows and, except for liquidity requirements and specialisation, no exchange would occur. For example, it we all had access to future issues of the *Wall Street Journal*, the price of every stock would be bid so as to equal the discounted value of the known future prices and dividends.[15]

Of course, we really needn't worry about destroying the market because it is not very likely that we will be perfect predictors. That is, accountants are, in the present state of the art, about as prone to err in predicting FCF as are decision makers. Thus, we have the choice of (1) not predicting or (2) presenting erroneous predictions. Erroneous predictions are not relevant to decision models. Indeed, they are likely to be harmful and, given the attitude of the courts about accountants' legal liability, this harm is likely to redound to accountants. For these reasons, I don't think that accountants should at this time report their predictions of FCF.[16] Since DCF is simply FCF discounted by a rate and since different rates are appropriate for different decision makers, it follows *a fortiori* that DCF is not an acceptable method of measuring income and wealth.

We noted that selling prices (EV) were relevant to all three market decision models. They are necessary to define market alternatives, they express the investment required to hold assets and they are a component of a risk indicator. For all of these reasons, I conclude that the items on the balance sheet should be valued at their present selling prices. Since income is defined as the difference between wealth (net worth) at two points in time, it follows that the income statement would be an explanation of the changes in the exit values on two successive balance sheets.

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[14] Future purchase prices of planned replacements and additions are also relevant since they are a component of FCF. Many people argue that income should be calculated on the basis of RC because it is a good predictor of FCF. This may or may not be true. It is an empirical question that cannot be settled here. It is important to note, however, that the claim of this argument is not that RC are relevant per se but rather that RC are good predictors of FCF. Note that this is my interpretation of the argument. It is usually stated that RC income is superior to other income concepts because it is a better predictor of future *RC income*. Using this reasoning, one could argue that straight-line depreciation is the superior depreciation concept because it is a perfect predictor of future straight-line depreciation. Obviously, this is not what the RC proponents mean. I think they mean that business income is the superior concept because it is a good predictor of a relevant property (FCF), not that it is superior because it is a good predictor of itself.

[15] *Supra* I said that the reason that knowledge of the future is so valuable is that it is so scarce. Note that in this case, it would not be valuable because it is not scarce. That is, the price of exclusive access to future issues of the *Wall Street Journal* would be extremely high. However, when everyone has equal access, the price would probably be about the same as the price of today's issue.

[16] This leaves the predictions of FCF up to the decision makers. This presents no problem insofar as managements are concerned. A major part of managements' function is to try to peer into the future in order to select the preferred consequence. The problem is that the managements' decisions, based upon *their* predictions, affect the well being of the creditor-investor. Unless the creditor-investor is willing to rely solely upon the managements' predictions, he must make independent predictions. In order for the creditor-investor to make an independent prediction, he must know, at least in broad outline, the managements' plans. The budget is the most likely source of information about managerial plans. The creditor-investor can peruse this budget and then make (or have his agent make) a prediction of the future cash flows that will result. Therefore, I would urge that we include a partially audited management budget in our reports because it provides the basis for an independent prediction of the future cash flows.

Thus, I am not opposed to expanding the accounting function so that it includes information about expected futures. On the contrary, I think that we should provide all the relevant information that we can. However, I don't think that erroneous predictions are relevant. (This includes those erroneous predictions which are disguised as 'past' cost allocations in HC. Recall those costs capitalised because of the 'future benefits' expected from the Edsel, Cleopatra, TFX, supersonic transports, etc.) If we get to the point where our ability to predict is better than that of the decision makers, then I will argue that we ought to report our predictions. In the meantime, I think the best we can do is to supply information to decision makers which will aid them in making their predictions.

Financial Statements and Personal Characteristics in Investment Decision Making

Haim Falk

1. Introduction

It is generally accepted that the purpose of financial statements is to furnish investment-decision makers with information about the company issuing the statements.[1] There is no simple answer to the question of who financial statements are intended for. Some people believe that financial statements should aim at investors[2] while others believe that financial statements should primarily aim at investment advisers.[3] The effect of accounting policy on the process of decision making has been studied within the last ten years,[4] but to the best of my knowledge not in Israel.

In this paper we describe an investigation into the relationships between the use of financial statements in investment-decision making and some characteristics of those who use the financial statements, i.e. the user's age, experience in investment-decision making, degree of concern, financial education, and frequency of reading financial journals. The population is described in Section 2, the scope and plan of the research are described in Section 3, and the findings are presented in Section 4. Section 5 is an application of Guttman's Smallest Space Analysis [Guttman (13) and Lingoes (16)] to a multivariable graphical analysis of the data.

2. The population

The population investigated consists of investment-decision makers in banks[5] and investment advisers in Israel[6]. From this population we took a sample of 22 decision makers in banks and 58 investment advisers; since some of the advisers refused to be interviewed, the findings relate to the whole of the banks sample and to 40 of the advisers.

3. The method

For a formal definition of the variables investigated, we employed the map ping sentence on page 210.[7]

Facet B deals with the strata of the population (decision makers in banks, b_1, and advisers, b_2). The topic of facet A is the relationships being examined. Elements a_1 and a_6 are represented by frequency of reading;[8] a_2 by the number of persons for whom the decision maker is economically responsible;[9] a_3, by his age; a_4, by seniority in his present job; and a_5, by his professional qualifications. Facet C deals with some common types of financial investment, and Facets D through F cover their characteristics.

The data were collected by means of a closed questionnaire to which the decision makers were asked to reply. The questions reflect all meaningful combinations of the elements in the content facets (i.e. the facets other than the range facet, which follows the arrow) of the mapping sentence. There

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[1] For example Horngren [14], Moonitz [17], Stone [19], and Dyckman [9].

[2] For example Moonitz [17], Greer [11], Choka [7], and Stone [19].

[3] For example Horngren [15], and Bradish [4].

[4] For example Bruns [5], Dyckman [8], and Bonini [3].

[5] In 1969 and 1970 there were around 50 banks in Israel which issued credit of I£3·8 billion in 1969 and I£4·4 billion in 1970; this is approximately 25 per cent of the total flow of credit [Bank of Israel, (1), pp. 294–5]. In the same period (1969) these banks held approximately 25 per cent of quoted securities [Central Bureau of Statistics, (6) pp. 488–9].

[6] In Israel most investment advice is given by the appropriate departments of the commercial banks.

Although the final decision on an investment rests with the investor, it can be assumed that an adviser's influence is so important that for practical purposes we may take advisers as the effective decision makers.

[7] The mapping sentence is a technique introduced by Guttman which permits simultaneous definition of all the variables under study by joining rules of selection with other concepts. The elements are sorted by the selection rules into facets (denoted by capital letters). For details of this approach, see Guttman [12] and Elizur [10].

[8] The relevant aspect of use of financial statements is 'intensity' of reading. However, it was not found possible to get useful replies to a question about how much or what parts of a financial statement are read, nor was direct observation of decision makers' behaviour practicable. The questionnaire therefore referred to frequency of reading, a not implausible proxy for 'intensity'.

[9] See Mosteller and Nogee [18].

A

The degree of
- a_1 use of financial statements
- a_2 concern for others
- a_3 maturity
- a_4 experience
- a_5 financial education
- a_6 use of financial journals

shown by the decision maker (x) while considering

B

- b_1 own investment
- b_2 advice to others to invest

C

in a limited company in Israel by
- buying
- c_1 ordinary shares
- c_2 preference shares
- c_3 making loans
- c_4 bonds
- c_5 any combination of the above elements

which

D

- d_1 are not
- d_2 are

quoted on the Stock Exchange

E

and which are secured
- e_1 not at all
- e_2 by assets or non-government guarantee
- e_3 by government guarantee

and which are linked

F

- f_1 to foreign currency
- f_2 half to foreign currency and half to Consumers Price Index
- f_3 not at all
- f_4 to the Consumers Price Index
- f_5 to any combination of the above elements

is →
- large
- .
- .
- .
- small

---

were 30 questions:[10]

22 questions on the frequency of using financial statements in considering 22 types of investment.

1 question on the number of people for which the respondent feels responsible.

1 question on the respondent's age.

1 question on the respondent's seniority in his job.

1 question about his financial education.

4 questions on the frequency with which he makes use of financial journals.

The possible answers to the questions were classified from high to low in a uniform manner as can be seen in the range facet. For example one of the questions designed to determine how often financial statements are used by the respondent when considering buying an investment was formulated as follows:

When you consider buying bonds which are quoted on the Stock Exchange and are linked to the Consumers Price Index, do you read the latest financial statements of the company concerned?

1. Yes, every time 2. Yes, usually 3. Yes, sometimes 4. Yes, but only in exceptional cases 5. No, I do not use financial statements 6. No, I do not consider buying such bonds.

This question combines elements a_1, b_1, c_3, d_2, e_2, and f_4. The combination of elements included in the content questions are listed in Appendix A. The correlations between the variables were calculated by using Guttman's Weak Monotonicity Coefficient μ_2.[11]

Like other correlation coefficients, μ_2 assumes values between -1 and 1. When $\mu_2=1$, there is a perfect (weak) positive monotonic relation between x and y. When $\mu_2=-1$, there is a perfect (weak) negative monotonic relation. When $\mu_2=0$, there is no monotonic relation, either positive or negative. Perfect positive weak monoticity means that if $h \geq i$ or $h \geq x$ then also $h \geq i$ or $h \geq y$, and this is true for all pairs of h and i.

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[10] A longer questionnaire was in fact used and a much more comprehensive investigation carried out, only part of which is reported here.

Of the 30 questions described here, only 23 were presented to advisers: there are eight types of investment (unquoted securities and government-guaranteed loans) not dealt with by advisers, while one of the questions relating to financial journals was split into two in the advisers' questionnaire.

4. The findings

The structure of the material differs to some extent in the two strata (i.e. banks and advisers). Each stratum will therefore be dealt with separately.

The correlations for banks are presented in Table 1. The extent to which financial statements are used is similar for investments of the same type as listed in facet C (shares, loans, bonds). This is also true for the subgroups of facet D (quoted and unquoted shares and bonds)[12] and facet E (degree of security),[13] as regards loans. The correlation coefficients for use of statements and degree of concern (question 23) do show some sort of pattern, which, however, we cannot interpret unambiguously. As can be seen from Table 2, the coefficients for all investment categories other than government-guaranteed bonds decline through the linkage characteristics in the order $f_3 > f_4 > f_2 > f_1$. Within the other facets, there is again a pattern, and again government-guaranteed bonds do not fit. Within unquoted investments (d_1), the coefficients decline through $e_1 > e_2 > e_3$ and from shares (c_1, c_2) to loans (c_3). Within quoted investments, the decline is from shares to bonds. On the whole, the older the respondent, the less use he makes of financial statements, and such positive correlations as there are, are very low. For loans, there is also some regularity across facets E and F (see Table 3), where the correlation tends to decline through $e_1 > e_2 > e_3$ and through $f_4 > f_1 > f_3$.

The overall picture is similar as regards experience – on the whole, the more experienced the respondent, the less use he makes of financial statements. The pattern for loans, however, though fairly regular, shows a different ranking of the elements from that for age (Table 4).

Financial education and use of statements show negative correlations for loans and close to zero correlations for most other types of investment. The pattern is shown in Table 5. The coefficients decline through $e_1 > e_2 > e_3$ in two of the three linkage categories (facet F) and through $f_3 > f_4 > f_1$ in two of the three guarantee categories (facet E). For bonds, the correlations are higher for quoted than unquoted, while there is no clear pattern according linkage to category.

Respondents who read one financial journal frequently also tend to read the others frequently. The correlations between use of financial statements and journals is for the most part positive.

The correlations (μ_2) for advisers are set out in Table 6. As for banks, statements are used to a similar extent for investment of the same (facet C) class.

Age and experience are strongly correlated, and, as with banks, those who read one journal tend to read them all. Use of statements and use of journals are positively correlated for three out of the five journals (and negatively for the other two), across all types of investment.

The higher the respondent's degree of concern, the more use he tends to make of financial statements. However, except in bonds, the coefficients are rather low. Foreign-currency linked and unlinked investments are differentiated fairly clearly by the size of the correlation, but the direction of the differences is not consistent enough for any clear pattern to emerge.

Financial education and use of statements are negatively correlated, more so for loans than for shares and bonds. The dominant distinction here may be that between quoted and unquoted investments (facet D).

The correlations between age and use of statements and experience and use of statements are generally weak.

5. A graphical analysis

Up to now we have discussed the relationships between the use made of financial statements and the other characteristics of investment decision makers listed in facet A. The discussion dealt with each variable (or group of variables) separately. However, it is useful to get an overall view of the material from a simultaneous analysis of the relationships between all the variables.

Such an analysis can be made by means of a graphical representation using the Smallest Space Analysis (SSA) technique developed by Guttman.[14]

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[11] Guttman's Weak Monotonicity Coefficient (μ_2) is calculated as

$$\mu_2 = \frac{\sum_{h=1}^{n-1} \sum_{i=1}^{n} (x_i - x_h)(y_i - y_h)}{\sum_{h=1}^{n-1} \sum_{i=1}^{n} \left| (x_i - x_h)(y_i - y_h) \right|},$$

where

x_h, x_i are the scores on variable x of respondents h and i

y_h, y_i are the scores on variable y of respondents h and i.

[12] Shares: questions 1–3, 19–22; bonds: questions 7 and 14, 15–18.

[13] Questions 4, 8, and 11; 5, 9, and 12; and 6, 10, and 13.

[14] Standard computer programs for SSA and other non-metrical subjects are based on the Guttman-Lingoes approach, developed by Lingoes [16], and the Israel Institute of Applied Social Research.

TABLE 1
Correlation coefficients (μ_2) for use of financial statements, degree of concern, age, experience, use of financia journals, and financial education: banks
(per cent)

Question Number	1	2	3	19	20	21	22	4	8	11	5	9
Use of financial statements when considering:												
Shares												
Unquoted												
1	—	88	90	86	92	94	95	45	67	85	69	18
2	88	—	100	85	91	85	93	45	67	23	69	31
3	90	100	—	86	91	87	94	50	70	29	71	35
Quoted												
19	86	85	86	—	99	99	98	70	82	79	100	56
20	92	91	91	99	—	100	100	60	77	72	100	48
21	94	85	87	99	100	—	100	73	80	87	100	57
22	95	93	94	98	100	100	—	66	79	76	100	53
Loans												
Unsecured												
4	45	45	50	70	60	73	66	—	82	80	79	96
8	67	67	70	82	77	80	79	82	—	100	39	84
11	85	23	29	79	72	87	76	80	100	—	68	80
Secured												
By assets or non-government guarantee												
5	69	69	71	100	100	100	100	79	39	68	—	66
9	18	31	35	56	48	57	53	96	84	80	66	—
12	48	57	60	75	69	74	72	18	88	90	59	96
By government guarantee												
6	36	57	50	86	79	80	69	54	30	57	99	56
10	43	68	64	84	77	73	74	40	10	33	94	58
13	28	51	51	72	62	64	68	64	47	61	91	98
Bonds												
Unquoted												
7	52	50	50	93	76	76	77	50	41	100	92	−5
14	59	56	56	96	83	88	84	81	100	100	92	98
Quoted												
15	88	72	73	98	95	98	94	68	76	90	83	35
16	81	78	79	99	97	96	95	52	78	80	85	39
17	57	79	77	95	89	88	88	60	100	90	78	94
18	68	65	65	97	95	96	91	28	36	58	73	62
Concern 23	65	65	68	33	67	61	71	−40	60	25	−20	18
Age 24	34	7	12	−43	−31	−17	−19	2	−20	3	−46	−57
Experience 25	−55	−44	−39	−53	−49	−53	−47	−12	−34	−57	−48	53
Use of financial journals												
27	32	0	−5	−22	−33	3	−26	29	6	46	9	24
28	−19	52	47	21	8	−4	16	−15	−8	−8	42	−16
29	17	33	39	60	61	54	74	62	55	43	61	56
30	6	36	35	38	55	45	62	−31	−20	9	68	22
Education 26	18	7	9	2	18	32	8	−30	−10	−16	−53	−23

Each variable is represented as a function of the correlations between the variables by a fixed point. The greater the correlation between two variables, the smaller the distance between the points in the space diagram [Bloombaum (2), Elizur (10), and Guttman (13)].

The extent to which the space diagram fits the correlation coefficients is expressed by Guttman's coefficient of alienation [13]; the lower the coefficient of alienation, the better is the fit between the diagram and the correlation coefficients. Complete fit is represented by a zero coefficient of alienation, and complete lack of fit by unity.

For the space diagram relating to banks, the coefficient was 0·251 in two dimensions; in three dimensions it improves to 0·166. The corresponding figures for advisers are 0·218 and 0·155 respectively. We therefore preferred the three-dimensional diagrams [for a more thorough discussion of three-dimensional analysis, see Guttman and Laumann (14)].

The correlations for banks are illustrated in Figure 1, in which we can discern two distinct relationship levels: (*a*) age, financial education, experience, and degree of concern (questions 24, 26, 25, and 23), and (*b*) use of financial statements and use of financial

6	10	13	7	14	15	16	17	18	23	24	25	27	28	29	30	26
36	43	28	52	59	88	81	57	68	65	34	−55	32	−19	17	6	18
57	68	51	50	56	72	78	79	65	65	7	−44	0	52	33	36	7
50	64	51	50	56	73	79	77	65	68	12	−39	−5	47	39	35	9
86	84	72	93	96	98	99	95	97	33	−43	−53	−22	21	60	38	2
79	77	62	76	83	95	97	89	95	67	−31	−49	−33	8	61	55	18
80	73	64	76	88	98	96	88	96	61	−17	−53	3	−4	54	45	32
69	74	68	77	84	94	95	88	91	71	−19	−47	−26	16	74	62	8
54	40	64	50	81	68	52	60	28	−40	2	−12	29	−15	62	−31	−30
30	10	47	41	100	76	78	100	36	60	−20	−34	6	−8	55	−22	−10
57	33	61	100	100	90	80	90	58	25	3	−57	46	−8	43	9	−16
99	94	91	92	92	83	85	78	73	−20	−46	−48	9	42	61	68	−53
56	58	98	−5	98	35	39	94	62	18	−57	53	24	−16	56	22	−23
46	39	77	26	99	62	65	97	44	−15	11	44	−6	−2	62	7	−45
—	95	86	78	84	76	74	81	70	−42	−61	−62	49	54	26	47	−39
95	—	93	82	81	73	73	81	80	−27	−82	−31	49	78	61	63	−60
86	93	—	47	88	54	55	87	71	−36	−69	−17	38	73	67	54	−50
78	82	47	—	90	98	91	80	90	39	−31	−69	41	54	72	38	−22
84	81	88	90	—	98	92	98	95	−14	−35	−71	46	46	53	14	13
76	73	54	98	98	—	99	94	97	36	−18	−44	21	5	38	41	11
74	73	55	91	92	99	—	95	96	40	−36	−34	−25	11	39	52	−2
81	81	87	80	98	94	95	—	95	22	−43	−49	−3	37	51	55	−15
70	80	71	90	95	97	96	95	—	61	−71	−20	−10	18	54	73	29
42	−27	−36	39	−14	36	40	22	61	—	−21	−8	9	−45	56	61	46
61	−82	−69	−31	−35	−18	−36	−43	−71	−21	—	25	−5	−68	−49	−40	44
62	−31	−17	−69	−71	−44	−34	−49	−20	−8	25	—	−39	−45	−11	12	−8
49	49	38	41	46	21	−25	−3	−10	9	−5	−39	—	16	−16	17	−31
54	78	73	54	46	5	11	37	18	−45	−68	−45	16	—	38	32	−50
26	61	67	72	53	38	39	51	54	56	−49	−11	−16	38	—	50	−56
47	63	54	38	14	41	52	55	73	61	−40	12	17	32	50	—	−45
39	−60	−50	−22	13	11	−2	−15	29	46	44	−8	−31	−50	−56	−45	—

journals. The distribution may be seen more clearly in Figure 2, which is Figure 1 in plan (i.e. seen from above). As may be seen, the questions relating to use of financial statements are closely associated; those relating to journals, are somewhat less close: of the four journals, three are quite close together, with the fourth (question 27) at some distance. The questions found in the first level (circled in the diagram) are only weakly correlated, the weakest correlations being for experience (question 25), on the periphery.

The distribution for advisers is illustrated in Figure 3, which shows three distinct levels: (*a*) Use of financial statements; (*b*) Financial education, degree of concern, reading a financial periodical (question 19) and a financial daily (question 22); and (c) age, experience, reading the economic supplement of a daily paper (question 21), the Stock Exchange quotations (question 23), and the other financial daily (question 20).

Financial education (question 18) is close to the upper boundary of the second level, so that this variable may be connected with the use of financial statements in the first level.

Again, the various relationships are more conveniently examined in plan (Figure 4). In the first level (unmarked questions numbers) there are clearly

TABLE 2
Correlations between use of financial statements and degree of concern: banks

(*per cent*)

		Unlinked	*Linked to*		
			Consumers Price Index	*Half to CPI, half to foreign currency*	*Foreign currency*
		f_3	f_4	f_2	f_1
Unquoted (d_1)					
Shares (c_1, c_2)	e_1	68	—	—	65
Loans (c_3)					
Unsecured	e_1	60	25	—	−40
Secured by assets	e_2	18	−15	—	−20
Government guaranteed	e_3	−27	−36	—	−42
Bonds (c_4) government guaranteed	e_3	—	−14	—	39
Quoted (d_2)					
Shares (c_1)	e_1	71	—	—	61
(c_2)		67	—	—	33
Bonds (c_4)	e_2	22	61	40	36

TABLE 3
Correlations between use of financial statements and age: banks

(*per cent*)

Loans (e_3)		*Linked to*		*Unlinked*
		Consumer Price Index f_4	*Foreign currency* f_1	f_3
Unsecured	e_1	3	2	−20
Secured by				
Assets	e_2	11	−46	−57
Government guarantee	e_3	−35	−61	−82

TABLE 4
Correlations between use of financial statements and experience: banks

(*per cent*)

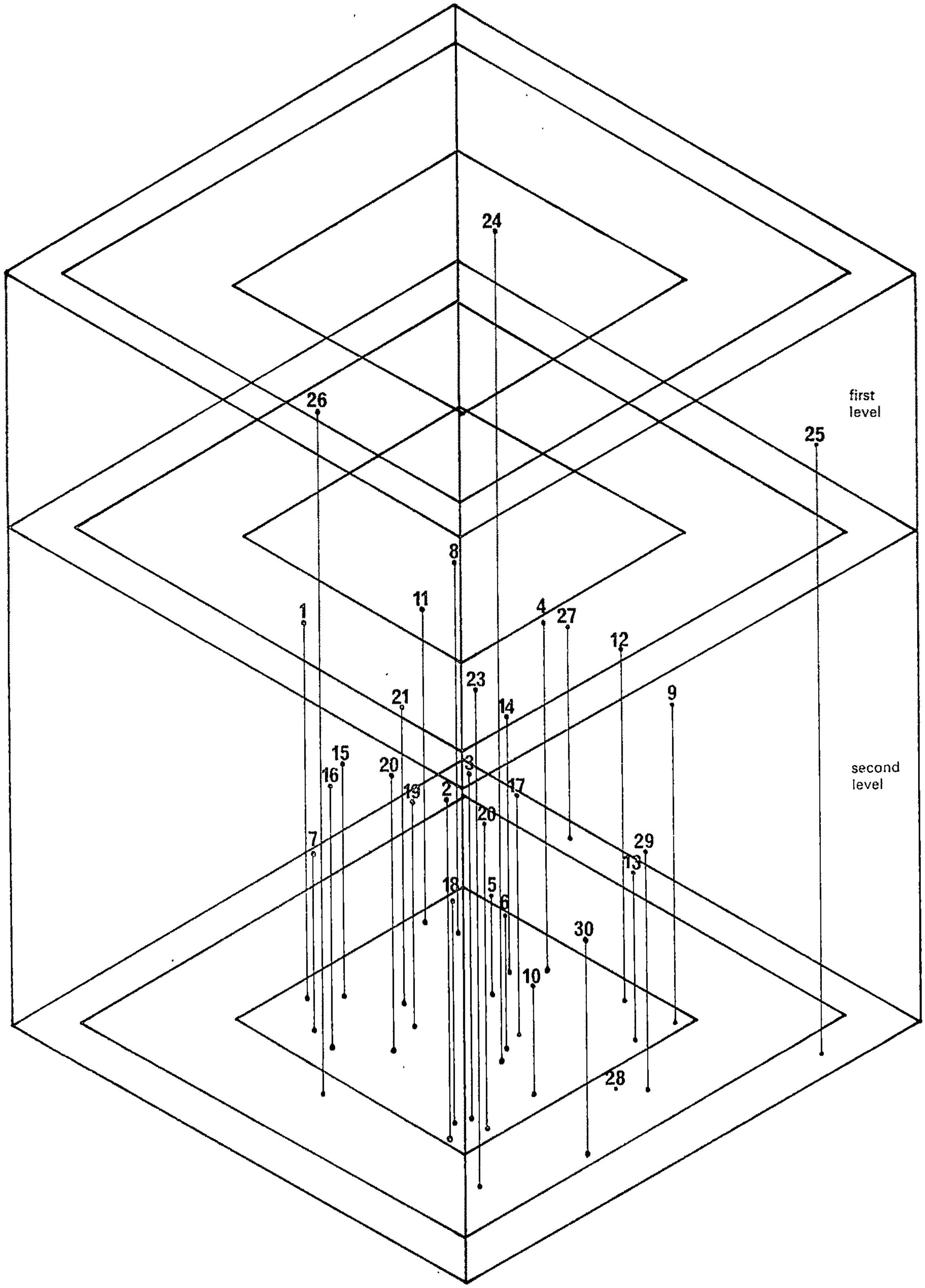
Loans (c_3)		*Foreign-currency linked* f_1	*Unlinked* f_3	*Linked to Consumer Price Index* f_4
Secured by				
Assets	e_2	−48	53	44
Government guarantee	e_3	−62	−31	−17
Unsecured	e_1	−12	−34	−57

two clusters of points: questions 7 through 14, relating to quoted securities, and questions 1 through 6, relating to loans. It is also clear from the figure that there is almost no connection between financial education (question 18) and use of financial statements; financial education is also connected only weakly with the other variables in the same level (circled in the figure).

In the third level (boxed question numbers) it is easy to see the close connection between use of journals (questions 20, 21, and 23) and between respondent's age and experience (questions 16 and 17).

FIGURE 1

Banks – Interaction of Variables: Space diagram a/



a/ The numbers denote the questions as listed in Appendix B, which gives the coordinates.

6. Summary

In this paper we have reported the results of a study which examined the connections between frequency of reading financial statements when considering different investments and various other characteristics of investment-decision makers – their age, experience, degree of concern, and financial education, and how often they read financial journals. The populations sampled were (*a*) investment-decision makers in banks and (*b*) investment advisers.

There are in both strata strong positive correlations for use of financial statements in each class of investment, that is respondents tend to use statements with similar frequency for investments of

TABLE 5
Correlations between use of financial statements and financial education: banks

(*per cent*)

		Unlinked f_3	*Linked to* *Consumers Price Index* f_4	 *Foreign currency* f_1
Loans (c_3)				
Unsecured	e_1	−10	−16	−30
Secured by				
Assets	e_2	−23	−45	−53
Government guarantee	e_3	−60	−50	−39
Bonds (c_4)				
Unquoted	d_1	—	13	−22
Quoted	d_2	−15	29	11

TABLE 6
Correlation coefficient (μ_2) for use of financial statements, degree of concern, age, experience, use of financial journals, and financial education: advisers
(*per cent*)

Question number		1	3	5	2	4	6	11	12	13
Use of financial statements when considering:										
Loans										
Unsecured										
	1	—	89	71	87	68	73	41	46	60
	3	89	—	84	66	81	81	41	50	39
	5	71	84	—	47	65	74	53	68	50
Secured										
	2	87	66	47	—	79	71	40	36	46
	4	68	81	65	79	—	91	32	55	27
	6	73	81	74	71	91	—	16	36	24
Quoted securities										
Shares										
	11	41	41	53	40	32	16	—	92	88
	12	46	50	68	36	55	36	92	—	80
	13	60	39	50	46	27	24	88	80	—
	14	73	54	66	41	40	41	76	88	92
Bonds										
	7	36	25	57	31	9	16	84	74	82
	8	44	37	67	42	40	48	81	73	89
	9	45	28	48	25	−8	−9	69	65	80
	10	32	26	50	34	32	39	81	72	82
Concern	15	27	−14	0	25	20	21	6	30	9
Age	16	−3	7	−3	2	−17	10	−28	−46	−12
Experience	17	−21	−34	−4	6	−27	5	−3	−8	1
Use of financial journals										
	19	−4	33	66	4	45	20	37	43	7
	20	5	−17	10	15	21	−3	5	27	9
	22	37	34	16	40	16	42	3	13	25
	21	−29	−37	−52	−40	−37	−45	−23	−70	−25
	23	−31	−53	−47	−14	−47	3	−27	−8	−16
Education	18	−43	−38	−9	−48	−39	−38	−14	−15	−8

similar type.

In the banks sample, there is a not very pronounced tendency for respondents to make less use of statements, the older and more experienced they are.

Financial education and the use of statements show a quite strong negative correlation in the case of loans, and a close to zero correlation in the case of shares and bonds. Degree of concern is positively correlated with use of statements for shares (strongly) and bonds (less strongly), and negatively with the use

TABLE 7
Correlations between use of financial statements and degree of concern: advisers

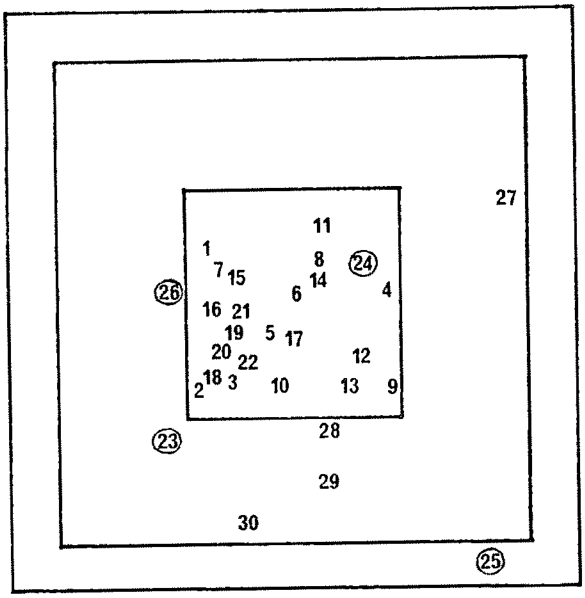
(per cent)

		Linked to			*Unlinked*
		Foreign currency f_1	*Half to CPI, half to currency* f_2	*Consumer Price Index* f_4	f_3
Unquoted (d_1)					
Loans (c_3)					
Unsecured	e_1	25	—	0	−14
Secured	e_2, e_3	25	—	21	20
Quoted (d_2)					
Bonds (c_4)	e_2, e_3	44	33	32	9
Shares	e_1				
Ordinary (c_1)		6			30
Preference (c_2)		9			17

7	8	9	10	15	16	17	19	20	22	21	23	18
36	44	45	32	27	−3	−21	−4	5	37	−29	−31	−43
25	37	28	26	−14	7	−34	33	−17	34	−37	−53	−38
57	67	48	50	0	−3	−4	66	10	16	−52	−47	−9
31	42	25	34	25	2	6	4	15	40	−40	−14	−48
9	40	−8	32	20	−17	−27	45	21	16	−37	−47	−39
16	48	−9	39	21	10	5	20	−3	42	−45	3	−38
84	81	69	81	6	−28	−3	37	5	3	−23	−27	−14
74	73	65	72	30	−46	−8	43	27	13	−70	−8	−15
82	89	80	82	9	−12	1	7	9	25	−25	−16	−8
84	79	77	75	17	−28	1	−3	22	24	−63	−4	−12
—	95	84	95	44	−1	26	27	17	−2	6	−9	−16
95	—	75	97	33	15	22	24	5	13	−7	−6	−25
84	75	—	67	9	−5	−7	47	15	13	40	−11	13
95	97	67	—	32	−6	11	13	20	21	24	15	−22
44	33	9	32	—	−20	−17	25	14	25	6	17	−16
−1	15	−5	−6	−20	—	71	−31	−15	24	15	28	18
26	22	−7	11	−17	71	—	−36	27	−27	27	15	−18
27	24	47	13	25	−31	−36	—	19	35	45	27	−21
17	5	15	20	14	−15	27	19	—	−8	64	54	−62
−2	13	13	21	25	24	−27	35	−8	—	33	−1	−62
6	−7	40	24	6	15	27	45	64	33	—	87	−50
−9	−6	−11	15	17	28	15	27	54	−1	87	—	−69
−16	−25	13	−22	−16	18	−18	−21	−62	−62	−50	−69	—

FIGURE 2

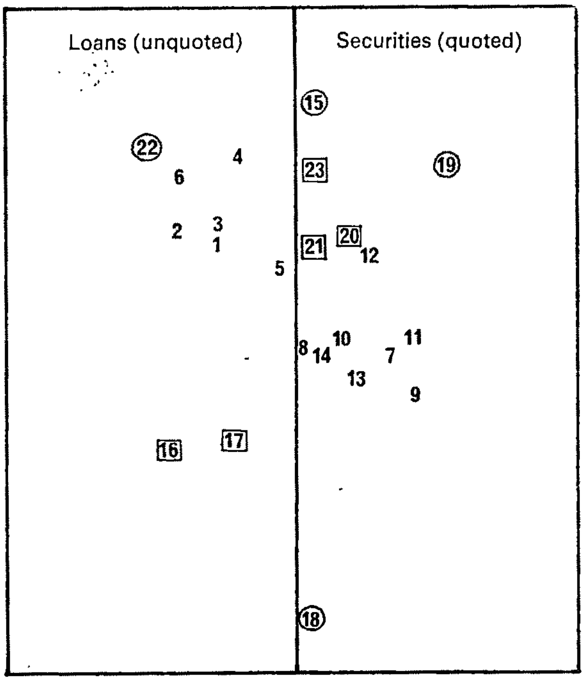
Banks – Interaction of Variables: Plan a/



a/ The numbers refer to the questions (circled for second level) as listed in Appendix B which gives the coordinates.

FIGURE 4

Advisors: Banks – Interaction of Variables · Plan a/



a/ The numbers refer to the questions: unmarked, at first level; circled, at second level; boxed, at third level. The questions and coordinates are listed in Appendix C.

of statements for making loans. Lastly, the use of statements is positively connected with the use of journals.

In the advisers sample, age and use of statements and experience and use of statements again show weak negative correlations. Financial education is negatively correlated with the use of statements, rather more strongly for loans than for quoted securities, although the relationship is not very strong in either case. The degree of concern is positively, but weakly, correlated with the use of financial statements in all types of investment. The correlation between the use of statements and the use of journals is weak: positive for three of the journals and negative for the other two.

All these results are reflected both by the μ_2 coefficients and, more clearly, by the graphical analysis, which makes it possible to distinguish between relationship levels. In the banks sample, two levels are distinguishable, with most variables in the second (only age, financial education, experience, and degree of concern come in the first level). In the advisers' sample, there are three levels: in the first, we find the use of financial statements in considering investments of various types; financial education, degree of concern, and two of the financial journals come in the second level; while age and the other three financial journals come in the third level.

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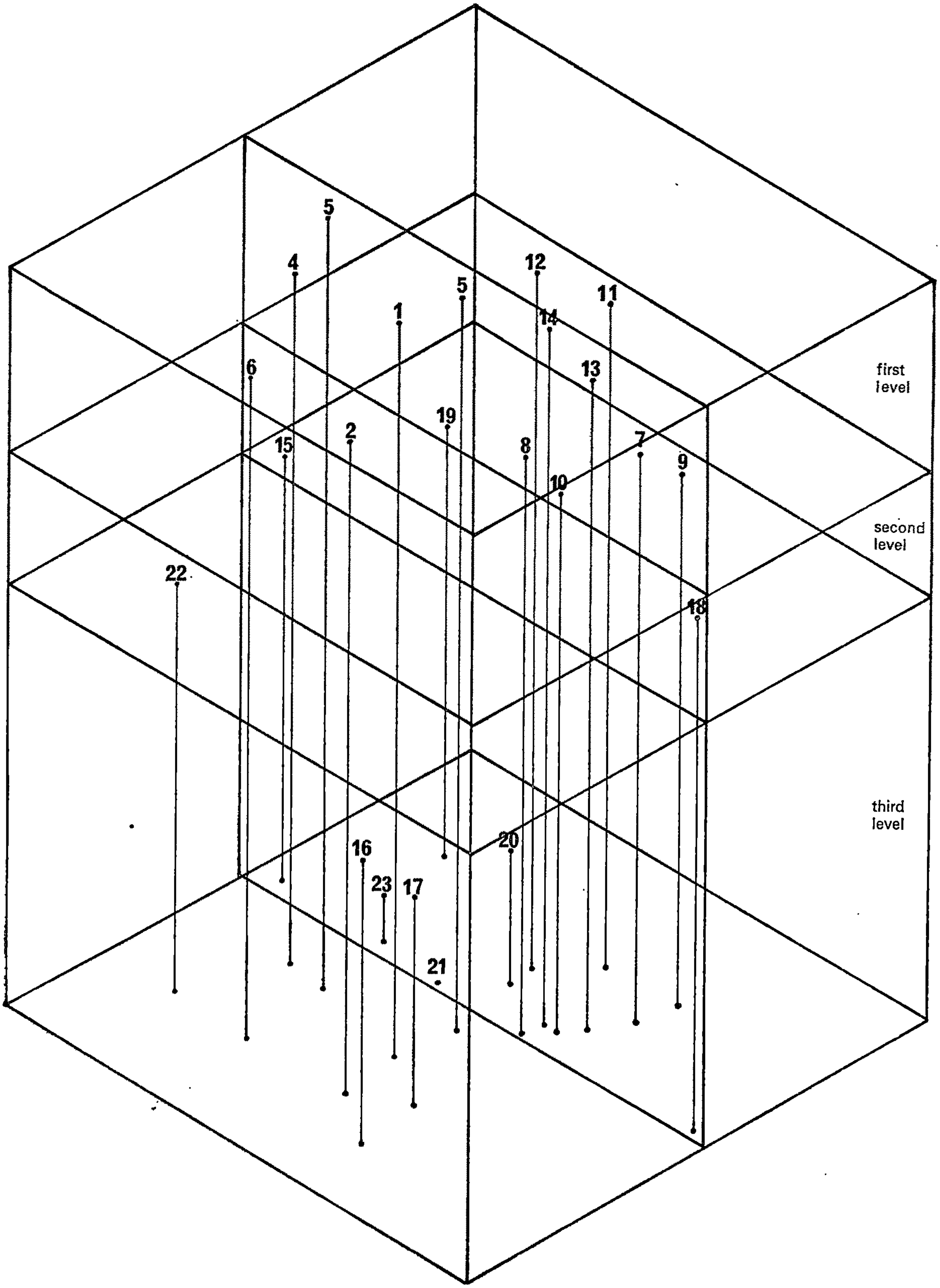
Appendix A
Combination of elements included in content questions

Banks							*Advisers*						
	Elements of facet							*Elements of facet*					
Question No.	*A*	*B*	*C*	*D*	*E*	*F*	*Question No.*	*A*	*B*	*C*	*D*	*E*	*F*
1	1	1	1	1	1	3							
2	1	1	2	1	1	1							
3	1	1	2	1	1	3							
4	1	1	3	1	1	1	1	1	2	3	1	1	1
5	1	1	3	1	2	1	2	1	2	3	1	2	1
6	1	1	3	1	3	1							
7	1	1	4	1	3	1							
8	1	1	3	1	1	3	3	1	2	3	1	1	3
9	1	1	3	1	2	3	4	1	2	3	1	2	3
10	1	1	3	1	3	3							
11	1	1	3	1	1	4	5	1	2	3	1	1	4
12	1	1	3	1	2	4	6	1	2	3	1	2	4
13	1	1	3	1	3	4							
14	1	1	4	1	3	4							
15	1	1	4	2	2	1	7	1	2	4	2	2	1
16	1	1	4	2	2	2	8	1	2	4	2	2	2
17	1	1	4	2	2	3	9	1	2	4	2	2	3
18	1	1	4	2	2	4	10	1	2	4	2	2	4
19	1	1	1	2	1	1	11	1	2	1	2	1	1
20	1	1	1	2	1	3	12	1	2	1	2	1	3
21	1	1	2	2	1	1	13	1	2	2	2	1	1
22	1	1	2	2	1	3	14	1	2	2	2	1	3
23	2	1	5	1, 2	1, 2, 3	5	15	2	2	5	1, 2	1, 2, 3	5
24	3	1	5	1, 2	1, 2, 3	5	16	3	2	5	1, 2	1, 2, 3	5
25	4	1	5	1, 2	1, 2, 3	5	17	4	2	5	1, 2	1, 2, 3	5
26	5	1	5	1, 2	1, 2, 3	5	18	5	2	5	1, 2	1, 2, 3	5
27–30[1]	6	1	5	1, 2	1, 2, 3	5	19–23[2]	6	2	5	1, 2	1, 2, 3	5

[1] Question 27 refers to the financial daily *Yom Yom*; question 28, to the economic supplement of a daily paper; question 29 to the monthly *Business Diary*; and question 30, to the daily Stock Exchange quotations.

[2] Questions 19 and 20 refer respectively to the financial dailies *Yom Yom* and *Bashaar*; question 21, to the economic supplement of a daily paper; question 22, to the monthly *Business Diary*; and question 23, to the daily Stock Exchange quotations.

FIGURE 3
Advisors: Banks—Interaction of Variables: Space diagram a/



a/The numbers denote the questions as listed in Appendix C, which gives the coordinates

Appendix B

Smallest Space Co-ordinates: Banks[1]

Question No.		*Co-ordinates* x	y	z
				First Level
24	Age	89	84	421
26	Financial education (performance qualifications)	—160	49	344
25	Experience (seniority in present job)	240	—252	279
23	Concern (number of persons for whom respondent is responsible)	—167	—120	165
				Second Level
1	Ordinary shares, unquoted	—104	90	75
8	Loans, unsecured, unlinked	31	87	66
3	Preference shares, unquoted, unlinked	91	44	56
12	Loans, secured by assets or non-government guarantee, linked to Consumer Price Index	112	—2	47
2	Preference shares, unquoted, in foreign currency or foreign-currency linked	—115	—48	38
4	Loans, unsecured, in foreign currency or foreign-currency linked	138	72	27
11	Loans, unsecured, linked to Consumers Price Index	38	127	11
9	Loans, secured by assets or non-government guarantee, unlinked	153	—34	4
21	Preference shares, quoted, in foreign currency	—63	35	—1
22	Preference shares, quoted, in Israeli currency	—67	—15	—9
20	Ordinary shares, quoted, in Israeli currency	—92	—1	—20
15	Bonds, quoted, in foreign currency or foreign-currency linked	—66	80	—30
16	Bonds, quoted, linked half to dollar and half to Consumers Price Index	—101	41	—41
17	Bonds, quoted, unlinked	12	11	—44
29	Financial monthly, *Business Diary*	66	—165	—50
14	Bonds, unquoted, government guaranteed, linked to Consumer Price Index	29	73	—52
27	Financial daily, *Yom Yom*	258	184	—53
19	Ordinary shares, quoted, in foreign currency	61	27	—55
18	Bonds, quoted, linked to Consumer Price Index	—101	—40	—77
30	Daily Stock Exchange quotations	—58	—224	—82
5	Loans, secured by assets or non-government guarantee, in foreign currency or foreign-currency linked	—23	—12	—117
13	Loans, government guaranteed, linked to Consumer Price Index	102	—31	—126
7	Bonds, unquoted, government guaranteed, foreign-currency linked	—84	71	—132
6	Loans, government guaranteed, in foreign currency or foreign-currency linked	15	60	—171
10	Loans, government guaranteed, unlinked	5	—30	—182
28	Financial supplement to a daily paper	66	—98	—289

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[1] The questions are ranked according to the *z* co-ordinate (height).

Appendix C

Smallest Space Co-ordinates: Advisers[1]

Question No.		*Co-ordinates* *x*	*y*	*z*
				First Level
3	Loans, unsecured, unlinked	55	84	197
5	Loans, unsecured, linked to Consumer Price Index	14	5	164
14	Preference shares, quoted, in Israeli currency	—43	—44	144
1	Loans, unsecured, in foreign currency or foreign-currency linked	38	89	150
12	Ordinary shares, quoted, in Israeli currency	27	—99	131
4	Loans, secured by assets or non-government guarantee, unlinked	150	67	125
11	Ordinary shares, quoted, in foreign currency	—37	—122	120
13	Preference shares, quoted, in foreign currency	—80	—53	113
6	Loans, secured by assets or non-government guarantee, linked to Consumer Price Index	107	142	102
2	Loans, secured by assets or non-government guarantee, in foreign currency or foreign-currency linked	41	140	99
8	Bonds, quoted linked half to dollar and half to Consumer Price Index	—42	—32	54
7	Bonds, quoted, in foreign currency or foreign-currency linked	—57	—101	34
9	Bonds, quoted, unlinked	—89	—134	18
10	Bonds, quoted, linked to Consumers Price Index	—34	—63	17
				Second Level
18	Financial education (professional qualifications)	—433	—44	1
19	Financial daily, *Yom Yom*	142	—168	—49
22	Financial monthly, *Business Diary*	154	177	—57
15	Concern (number of persons for whom respondent is responsible)	233	—57	—67
				Third Level
16	Age	—185	242	—150
17	Experience (seniority in present job)	—173	125	—229
20	Financial daily, *Bashaar*	48	—80	—241
23	Daily Stock Exchange quotations	130	—46	—324
21	Financial supplement to a daily paper	33	—29	—352

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[1] The questions are ranked according to the *z* co-ordinate (height).

Psychological Aspects of Accounting

T. A. Lee

Introduction

The 1960s witnessed a significant change in accounting thought – the switch in emphasis from 'how to do it?' towards the more complex question of 'why do it?'. This trend, which is now gathering momentum, concentrates not so much on the accountant as a master technician, but more on someone who, as well as having considerable technical skills, is able to apply these skills at the best time, in the most appropriate circumstances, and for the right person. It is in this climate of changing thought that the behavioural aspects of accounting are being introduced gradually to accounting education and research – particularly, the impact of accounting (its systems and information) on human behaviour, and the converse impact of human behaviour on accounting.

The purpose of this paper is educational, being intended to outline the aforementioned change in accounting thought for the benefit of both the accounting practitioner and the business manager. The aim is to show that accounting cannot and should not be regarded as merely an intricate mechanical process, involving the quantification of certain aspects of economic activity. Instead, it will be portrayed as a social service, involving people, which is designed to influence human behaviour within the economic environment. It is hoped that readers will see that accounting is as much a behavioural process as it is a technical one; and that there are justifying grounds for calling this aspect of the discipline, behavioural accounting.

To those accountants and managers who have ignored the behavioural implications of accounting (either consciously or unwittingly), the message is simple but vital – accounting and human behaviour in business are interrelated. If accounting ignores human behaviour, it becomes no more than a meaningless and costly burden to business and society.

The paper will develop the theme of behavioural accounting in three main parts.

1. An exploratory examination of the accounting process will be made, in order to pinpoint the main behavioural characteristics requiring a greater understanding by accountants and business managers than presently exists.
2. The next stage will entail a relatively broad analysis of several of the main concepts of psychology which are felt to have the greatest relevance and applicability to the development of behavioural accounting.
3. Lastly, there will be a brief look at several research projects and writings which, in recent times, have tried to investigate the applicability of the above concepts of psychology to accounting, in order to develop the aforementioned state of understanding.

Whenever relevant, the reader will be referred to specific writings in particular areas. It should be noted that these have been chosen, where possible, for their readability and moderate length, as well as for their overall significance and contribution to accounting thought. There are many others which could be referred to by the serious student of behavioural accounting, and these are noted for this purpose in the appendices to the Report of the Committee on *Behavioural Science Content of the Accounting Curriculum*, published by the American Accounting Association in 1971.

The behavioural nature of accounting[1]

1. *Accounting involves people, both as producers and consumers*

When describing accounting, it is extremely hard *not* to talk or write of people and their involvement in the accounting process. People are responsible for administering the accounting system and producing accounting information. In most businesses, people are actively engaged in processing accounting information. In the majority of instances, what is being accounted for is essentially the results of people's behaviour. At the end of the day, it is people who make use of the main product of the accounting process – information – in order to behave in a determined manner when either planning, making decisions, or taking action. These appear to be obvious points but, sadly, the part played by people in the accounting process has largely been ignored, whilst the process itself has been rapidly developed technically over the years. It is time that the place of people in accounting thought was better advertised.

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[1] For an alternative examination of the behavioural characteristics of accounting, *see* Vahe Baladouni, 'The Accounting Perspective Re-Examined', *The Accounting Review*, April 1966, pp. 215–25.

2. *The demand for accounting information stems from a state of anxiety*

Accounting is essentially a service function – the service being the supply of information describing aspects of economic activity conducted within a defined business entity. The demand for such information comes from people involved or interested in such activity, and their need for this information evolves from a lack of knowledge of the entity's affairs – for, by definition, information exists to increase knowledge. These persons are concerned with making decisions and taking action in connection with their involvement or interest in the entity and, generally speaking, find that they lack sufficient knowledge to decide or act with any degree of certainty. This state of anxiety, based on uncertainty, underlies all informational needs of an accounting nature. It is a characteristic of human behaviour which accounting information is intended to alleviate or eliminate.

3. *Accounting information is intended to influence human behaviour*

It follows from 2 above that if the need for accounting information arises from lack of knowledge and thus, uncertainty regarding economic activity, the supply of such information to decision makers and actors is intended to alleviate their state of anxiety, by minimising their uncertainty and increasing their knowledge. In this way, accounting information should facilitate the making of decisions and taking of action. Thus, if it is used for such purposes, it can only be described as influencing human behaviour. It is important, therefore, that such an influence should be in the best interests of the people concerned.

4. *Accounting information influences human behaviour in different ways*

In general, most types of information are known to influence human behaviour in a variety of ways – that is, the same information can cause individual persons to act differently. Much depends on the meaning attributed to the words or terms used; the means by which the information is presented to its users; the various levels of skill, experience and understanding of its users; and, most important, the attitudes of such users to the information and its subject-matter. The same may be said with regard to the influence of accounting information on the behaviour of its decision making users – not all of them being capable of reacting in precisely the same way to the same information. A minimisation of such variations should be aimed for, whenever possible, in order to maximise the benefits to be derived from the overall use of accounting information.

5. *Different states of uncertainty and knowledge create differing information needs*

There are a variety of persons involved or interested in the economic activity and affairs of a single business entity. Some are located within it as managers and employees; others are located externally – for example, investors, lenders, bankers, customers and suppliers. All have a general yet common interest in the potential survival and profitability of the business, but each has differing management functions to conduct, objectives to aim for, knowledge states, and so on, *vis-à-vis* the entity. This means that informational needs of an accounting nature are more than likely to vary from person to person; or at least, from one group of persons to another. It is important, therefore, that the accounting information which is supplied to an individual user is appropriate to his particular information need and, thus, is likely to influence his behaviour suitably. Use of the 'wrong' type of accounting information can activate behaviour which is harmful or, at least, not as beneficial as it might otherwise be.

6. *The processor of accounting information is in a position to influence its quality*

If it is accepted that decision makers and other participants in business activity require accounting information to fill knowledge gaps, it must also be accepted that someone, or some persons, must be capable of supplying such information to satisfy the demand. In most instances, the information user is not in a position to produce information for his own use, for fairly obvious reasons relating to skill, experience, location, time and cost. Therefore, he has to rely on other persons to undertake this function on his behalf. Because of this, accountants and their staffs are entrusted with the tasks of selecting, recording and processing accounting data, putting it in communicable form, and reporting the resultant information to its potential user(s). The accountant (processor) is therefore in a position to determine not only the content of accounting communications, but also the quality of the various informational items contained in them. It is vitally important that this influence on the construction of accounting information is honest, credible and, above all, reliable. In other words, the influence of the processor on accounting information must not be detrimental to the corresponding influence of the information on its user. This is an example of one man's behaviour being capable of influencing another's through the communication of formal information.

7. To a great extent, the credibility of accounting information determines the degree of influence it has on its user's behaviour

It is presumed, in the majority of cases, that people will only use information (whatever its nature) and thereby allow it to influence their behaviour, if they have confidence and belief in its reliability, and in its processor's objectivity. (Note: the fact that information users believe that these qualities exist does not mean automatically that the information is in fact reliable or objective.) In other words, the extent to which user behaviour is affected by accounting information will almost certainly depend on how credible it appears to the user. In this connection, the credibility of the information rests largely on the corresponding credibility of the information process and processor. To the extent that *they* lack credibility, the accounting information will lack credibility in the eyes of its potential user.

8. The audit function is intended to remove or minimise a state of anxiety

If it is accepted that the degree of use and behavioural influence of accounting information depends so much on its credibility, it is essential that there is a reliable and feasible means of establishing this state for the benefit of the potential user. For many years, the audit function of examining and reporting on accounting information has existed for just such a purpose. The opinion contained in the familiar audit report is intended to remove the natural uncertainty and anxiety which exists with regard to the credibility of accounting information. Because the users of accounting information are either too remote from the business entity, or lack sufficient skill and experience to personally verify accounting information credibility, they must remain uncertain about the latter factor until such time as it is examined and reported on by someone appointed for such a task. For this reason, the auditor not only has a considerable role to play in giving the user confidence to use the information, but he also has a considerable bearing on the degree of influence which it has on the user's decisions and actions – the more credible the information, the more the user is likely to allow it to influence his behaviour.

Concepts of psychology of relevance to accounting

In the previous sections, the aim has been to convey to the reader the knowledge that accounting is a behavioural process, involving people, and influencing or being influenced by human behaviour. It therefore appears to be appropriate to look more closely at behavioural science in general, and psychology in particular, in order to examine certain behavioural concepts which appear to have the greatest relevance to the study of accounting.

1. The nature of behavioural science

Behavioural science is a term which is being increasingly used by accounting writers; unfortunately with little regard to its meaning. Hilgard and Atkinson define it as 'the sciences concerned in one way or another with the behaviour of man or lower organisms; especially social anthropology, psychology and sociology, but including some aspects of biology, economics, political science, history, philosophy, and other fields of study'.[2] It is therefore a term covering any discipline which can be said to have a bearing or influence on the study of human and animal behaviour. In several writings on behavioural accounting, however, it is loosely used to describe the specific study of psychology; the science wholly devoted to the study of human and animal behaviour. It is towards certain concepts of psychology that this section of the paper is devoted.

2. Sign-posting the way

In 1960, Devine made a clear statement for the pursuance of accounting research in the behavioural science field, strongly condemning the 'heavy-handed crudity' of such work up to that point in time.[3] However, despite an obvious improvement in the quality of post-1960 research, Hofstedt and Kinard found it necessary, in 1970, to complain that work in this field up to that time was (*a*) not definitive, despite individual project relevance; (*b*) not part of an overall plan – individual projects rarely being related to one another, thereby lacking a common purpose; and (*c*) lacking in results with a definite practical application.[4] Whilst acknowledging the lack of behavioural science principles to apply directly to accounting, Hofstedt and Kinard felt that these could be developed if accountants would be prepared to work with behavioural scientists with knowledge of related research fields. In 1971, an American Accounting Association committee produced a report which indicated several such fields in the area of psychology, each regarded as relevant to teaching as well as to research in accounting.[5] Three of these topics, of the greatest relevance to accounting, are *perception* – 'the problem of correspondence between the nature of the physical world and the character of sensory experience';[6] *motivation* – 'understanding why individuals choose certain actions and reject others and why they persist in a chosen action, even in the face of difficulties and obstacles';[7] and *attitudes* – 'as an individual develops, his perceptions, feelings and action-tendencies with respect to various objects become organised into enduring systems called attitudes'.[8]

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[2] Ernest R. Hilgard and Richard C. Atkinson, *Introduction to Psychology*, 4th Edition, Harcourt, Brace and World, 1967, p. 619.

[3] Carl T. Devine, 'Research Methodology and Accounting Theory Formation', *The Accounting Review*, July 1960, pp. 387–99; especially pp. 394–7.

3. *The concept of perception*

Hilgard and Atkinson have defined the concept of perception as 'the process of becoming aware of objects, qualities, or relations by way of the sense organs. While sensory content is always present in perception, what is perceived is influenced by set and prior experience, so that perception is more than a passive registration of stimuli impinging on the sense organs'.[9] This particular concept is important to accounting because one of the main means by which the decision maker or actor in business becomes aware of the nature and detail of the economic activity being conducted in the business entity is through the stimulus of reported accounting information. The effect of accounting information on an individual's perceptions of the entity is of vital interest, to accountants – for example, does the information user perceive the same things in information as the processor perceived when preparing it? If not, to what extent do those perceptions vary, and by how much do they affect decisions and actions subsequently made by him? Assuming the information to be honestly and objectively prepared, the aim should be to ensure that what the user perceives with regard to the entity is what the processor intended him to perceive.

Other aspects of the perception concept of interest to accountants are as follows:

3.1. *Needs and personal values* – Psychologists generally accept the view that an individual will only perceive matters which he feels are of use to him, and which he personally needs and values. So far as accounting is concerned, it just be presumed that the information user will only use and perceive from items of information which he regards as relevant and useful to him. Knowledge of these needs and values, therefore, would be extremely helpful in determining the relative usefulness of various types and items of reportable accounting information.

3.2. *Capacity to perceive* – An individual can only perceive so much at one time because, as a human being, he can only focus attention on a limited number of factors simultaneously. He cannot see, hear, smell or touch everything there is to see, hear, smell or touch; this would be a physical as well as a mental impossibility. Applying this observation to accounting, it is evident that it is a principle of perception which could be extremely important in the areas of (*a*) *observing* economic activity to account for and report on (can the information processor perceive all that should be accounted and reported? – if not, how much does he miss?); and (*b*) *reporting* accounting information (is too much information reported? – how does this affect the user's perceptions of the business? – is it a case of 'not being able to see the wood for the trees'? – would the user be able to perceive more about the business if he was presented with less information than at present?).

3.3. *The basis of experience* – Individuals learn to perceive gradually. As their knowledge, skill and experience grow, their awareness and senses develop to absorb and analyse more and more information. This rather obvious, but, at times, complex relationship determines their perception levels. Psychologists have isolated two distinct levels of perception in this respect – (*a*) the *absolute threshold* this is the point at which an individual is stimulated sufficiently to perceive something for the first time (for example, the minimum level of accounting information required by a person to perceive the overall profitability or financial position of a business); and (*b*) the *difference threshold* – this is the point at which the individual commences to perceive changes and differences in the stimuli influencing his behaviour (for example, the point at which an item of accounting information, or an error discovered in auditing, becomes material enough to require further investigation or action). It is vital to the development of accounting that more is known about these thresholds, and the effect of ever-increasing experience on them, because both what is processed and what is used in relation to accounting information is greatly determined by these factors.

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[4] Thomas R. Hofstedt and James C. Kinard, 'A Strategy for Behavioral Accounting Research', *The Accounting Review*, January 1970, pp. 38–54.

[5] Report of the Committee on *Behavioral Science Content of the Accounting Curriculum*, American Accounting Association, 1971.

[6] 1971 AAA Committee, op. cit., p. 249.

[7] Ibid, p. 252.

[8] Ibid, p. 257.

[9] op. cit., p. 632.

3.4. *The effect of conditioning* – Through the learning process, individuals can be conditioned to perceive. The danger then is that they can become so familiar with the stimuli, and the resultant perceptions, that they start to perceive what they *expect* to perceive, rather than what they ought to perceive. It would be interesting to find out if regular accounting reports (for example, for internal management) could have this effect when the information contained in them was sufficiently repetitive.

4. *The concept of attitude*

This is one of the most fundamental aspects of human behaviour. Individuals are continually formulating personal attitudes to a variety of objects (both animate and inanimate) during their lifetimes, to such effect that the nature and quality of human behaviour is very much determined by such factors. Hilgard and Atkinson have defined attitudes as 'an orientation toward or away from some object, concept, or situation; a readiness to respond in a predetermined manner to the object, concept, or situation'.[10] In other words, it is a state of readiness to respond, either physically or mentally, to particular situations. In this sense, it greatly influences the nature of human behaviour and, in many instances, predetermines it. Newcomb has well described the state of readiness associated with attitudes: 'An attitude is the individual's organisation of psychological processes, as inferred from his behaviour, with respect to some aspect of the world which he distinguishes from other aspects. It represents the residue of his previous experience with which he approaches any subsequent situation including that aspect and, together with the contemporary influences in such a situation, determines his behaviour in it. Attitudes are enduring, in the sense that such residues are carried over to new situations, but they change insofar as new residues are acquired through experience in new situations.'[11] If this organisation of mental processes has such an important bearing on determining human behaviour, it is important for accountants to look more closely at some of the main aspects of the concept of attitude which may have some bearing on the development of accounting.

4.1. *The basis of experience* – Attitudes are based essentially on the previous experience of the individual, and this is of vital concern to accountants studying not only the use of accounting information, but also its processing. Thus, the past experience of users and processors in relation to accounting information can establish attitudes which, in turn, will determine the extent to which they make use of the information, on the one hand, and the extent to which it is processed, on the other hand. For example, the question of whether or not accounting information is processed will depend, *inter alia*, on the emphasis put on formal information processing systems by business management; how highly accounting information and accountants are valued by senior management; and the extent to which senior management regards it as important to communicate within and outwith the business. In addition, the extent to which this accounting information is used will depend, *inter alia*, on whether decision makers 'like' it; have confidence in it; find it useful; and value it *vis-à-vis* other sources of information about the business. These attitudes must be better understood by accountants attempting to resolve problems in the area of improving the usage and processing of such information.

4.2. *Attitudes can change* – As mentioned previously, attitudes are not enduring mental structures; instead, they are open to change due to new experiences negating prior ones. It is important, therefore, that accountants realise that this principle can apply just as much to the area of accounting as it can to more familiar social areas – such as sex, violence or religion; that is, individuals will hold favourable attitudes until experience changes them to unfavourable ones, or vice versa. In this way, the quality of accounting information, systems, and accountants themselves can determine the value placed on accounting not only by business managers and other information users but, more widely, by society as a whole. In addition, it is important that accountants realise that the accounting information they process may well have a significant effect on the existing attitudes of its users toward particular objects, functions and persons within the business environment. Likewise, it can help materially in formulating new attitudes toward such factors.

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[10] op. cit., p. 619.

[11] T. M. Newcomb, 'On the Definition of Attitudes', in *Attitudes*, eds. Marie Jahoda and Neil Warren, Penguin, 1966, p. 22.

4.3. *Dynamic assessments* – An attitude is a dynamic assessment of a given situation. One vital factor emerges from this, and that is that once such an assessment has been made, certain objects become relevant to the individual concerned, whilst others become irrelevant. Obviously, this can create a rigidity of mind which is harmful to the individual – for example, in relation to accounting information, a decision maker could be ignoring certain items of information (or indeed, full reports) because of a set attitude towards such potential stimuli, despite the fact that they could be of the utmost use and importance to him in his decision making activities.

4.4. *Attitudes breed preconception* – It is an unfortunate by-product of the mental rigidity created by attitudes that preconception results – that is, the individual enters a situation with his mind 'made up', causing the situation to be wrongly or badly handled. So far as accounting is concerned this could mean, for example, that accounting information was wrongly or badly used; and that either such information was ignored or failed to detract its user from a pre-determined decision or course of action. In such situations, it is vital that business managers, as well as accountants, realise that preconception exists, and, therefore, that they should do all in their power to ensure the information is properly received and used.

4.5. *Judgements can be effected* – The net result of the aforementioned comments is that the judgement of an individual can be seriously impaired by the formulation of attitudes, resulting in a rigidity in the selection of stimuli, and a possible preconception of future situations. As previously discussed, this can affect not only the nature and degree of usage made of accounting information, systems and accountants, but can also present a challenge to ensure that the use made of accounting is such that judgements are properly and rationally formulated, and that appropriate behaviour results.

5. *The concept of motivation*

Arguably perhaps, this appears to be the most important concept in the literature of psychology. Research findings related to it reveal what makes an individual 'tick' – that is, *why* he behaves as he does, rather than *how* he behaves. Essentially, it is based on such factors as needs, urges, desires and impulses and, perhaps putting it over-simply, it is the formulation of incentives to certain patterns of behaviour. These incentives or goals are not motives in themselves, but they exist with the basic 'drive' which a motive creates. This drive toward a formulated goal remains dormant until such time as it is stimulated. This relationship can be explained as follows: firstly, a motive results in the formulation of specific incentives or goals to which the individual can physically or mentally direct himself at any time; secondly, the dormant 'drive' created by the motive/incentive relationship becomes aroused by a definable stimulus; and thirdly, the individual's behaviour is 'motivated' in a set direction.

At this stage, formal definitions of the above terms are appropriate before going further. Hilgard and Atkinson have defined them as follows: '*Motive* – any condition of the organism that affects its readiness to start upon or continue in a sequence of behaviour';[12] in other words, the factor determining a pattern of behaviour: '*Goal* (Incentive) – an end state or condition toward which the motivated behaviour sequence is directed and by which the sequence is completed';[13] that is, the goal which is likely to comply with or satisfy the underlying motive: '*Drive* – an aroused condition of the organism based upon deprivation or noxious stimulation, including tissue needs, drug or hormonal conditions, and specified internal or external stimuli, as in pain';[14] here there is an obvious relationship with the motive itself, the drive essentially being the aroused or stimulated condition evolving from the basic motive: '*Stimulus* – (1) some specific physical energy impinging upon a receptor sensitive to that kind of energy. (2) Any objectively describable situation or event (whether outside or inside the organism) that is the occasion for the organism's response';[15] that is, the means of 'triggering off' behaviour towards a specific goal.

Taking each of these definitions, it is now possible to develop them still further by drawing certain conclusions from them of relevance to the study of accounting.

5.1. *Primary and secondary motives* – Psychologists have identified two main types of motive; (*a*) *primary* motives, which are mainly primitive, biological and instinctive – these include sleep, food and sex, and therefore appear to have little obvious connection with the study of a complex learned process such as accounting; and (*b*) *secondary* motives, which are mainly acquired and learned by the individual through experience, observation and perception – these include such conditions as social status, ambition, wealth and job satisfaction. In accounting, therefore, it is essentially secondary motives which underlie human behaviour – for example, job security or power and responsibility.

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[12] op. cit., p. 630.
[13] Ibid, p. 626.
[14] Ibid, p. 623.
[15] Ibid, p. 638.

5.2. *Motives aim for satisfaction* – The aim of all motives is to obtain satisfaction by achieving the defined goals or incentives. Once satisfied the so-called drive state is dormant until aroused by an internal or external stimulus. Whether the drives are dormant or not, however, the motives remain. In business, some of the goals which the individual may try to achieve in order to obtain motive satisfaction include the survival of the business entity, maximisation of profits, and good labour relations. These goals should not be confused with their prior motives.

5.3. *Distinguish motives and stimuli* – It is essential not to confuse the motives behind behaviour with the stimuli which arouse the relevant drive state. The nature and quality of stimuli determine the nature and quality of behaviour. Motives and related drives have no such part to play. As Brown has stated: 'Because drives, as such, are regarded as incapable of steering or directing behaviour, it is necessary to deny that individuals can acquire drives for any specific goal objective or situations whatsoever. What individuals do acquire are numerous habits or modes of reacting to complex situations made up of both external and internal stimulus components'.[16]

So far as accountants are concerned, accounting information is a stimulus to particular behaviour in business (and to this extent it may be regarded as a motivating force in decision making and its related activities), but it is *not* a motive to action. Its effect is to trigger off the drive towards a particular goal. It provides the knowledge which allows the decision maker or actor in business to behave in a manner directed at the achievement of a goal. On the other hand, it is the motive behind the goal which provides the drive which accounting information stimulates. The nature of these motives and goals, and the effect of accounting information on the resultant drive states, should be of the utmost concern to accountants trying to assess the relative usefulness and relevance of accounting information.

Applications of behavioural science to accounting

Having looked at accounting from the psychological point of view, and psychology from the accounting point of view, the next stage is to look at some of the areas of accounting in which the two disciplines have been jointly applied by writers and researchers. Despite the relatively recent interest in this area by accountants, there are a surprisingly large number of projects and writings from which material can be drawn. For this reason, only certain of these will be referred to in this paper, being a representative sample of the body of literature which exists at the present time.

1. *The behavioural foundations to accounting*

A number of writers have argued in recent years that more attention must be paid to the user of accounting information.[17] They have advocated that the only useful information is relevant information – that is, information which influences or bears upon the decisions and actions of its user. In this respect, they have described accounting information as an important stimulus or motivating force in relation to the behaviour of the business decision maker or actor. In other words, accounting information exists to influence behaviour. Chambers has produced the most logical and detailed argument in support of the latter observation, emphasising the important role of the information processor who acts as an agent for the information user, and who should be producing information which is neutral, objective, and thus generally relevant to an individual user.[18] He has also outlined a major problem in the related areas of perception, stating that there is a danger that what the processor observes, and transmits in the language of accounting to the user, could be perceived differently by the user due to the problem of varying meanings for technical terms, etc.[19]

In summary therefore, the growing emphasis on the concept of information relevance in accounting, as outlined in these writings, has provided a behavioural foundation to accounting thought. The remaining sections of this paper attempt to show the development of this foundation in more detail.

2. *Testing accounting information utility*

There have been several experiments recently to test the usefulness of financial accounting information as a stimulus or motivating force in the making and taking of investment decisions and actions. In 1967, Benston attempted to correlate published accounting data for selected companies with previously published earnings expectations and subsequent share price movements, in order to find out which data confirmed or rejected prior expectations, and thereby influenced share prices through subsequent purchases or sales of shares.[20] He found that accounting data were only a small part of the total information used by investors for such decisions; that little correlation could be found between published data expectations and subsequent share prices; and that the hypothesis that there was such a direct relationship was itself doubtful.

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[16] J. S. Brown, 'Problems Presented by the Concept of Acquired Drives', in *Motivation*, eds. Dalbir Bindra and Jane Stewart, Penguin, 1966, p. 141.

[17] For example, *see* Raymond J. Chambers, *Accounting, Evaluation and Economic Behavior*, Prentice-Hall, 1966, particularly pp. 141–85; Keith Shwayder, 'Relevance', *Journal of Accounting Research*, Spring 1968, pp. 86–97; and T. A. Lee, 'Utility and Relevance – the search for reliable financial accounting information', *Accounting and Business Research*, Summer 1971, pp. 242–9.

[18] op. cit., pp. 148–56.

[19] Ibid, pp. 166–85.

Estes, in 1968, surveyed certain users of financial accounting information (financial analysts, financial executives and bankers) to find out how relevant and useful they felt current cost and price-level adjusted accounting information to be.[21] His findings revealed that all groups felt both types would be useful, although the financial executives tended to be the least enthusiastic. Estes was doubtful, however, about the representativeness of the views expressed in this survey.

Soon after the Estes study, Brenner conducted a complementary investigation in which he surveyed stockholders, bankers and financial analysts regarding their views on the usefulness of current cost accounting information.[22] The survey revealed (together with the Estes findings) that current cost information was generally regarded as a useful addition to the traditional historic cost information, but that few persons desired it as a complete replacement to the latter.

In 1970, Pankoff and Virgil attempted to assess the relative usefulness of items of accounting information by, *inter alia*, measuring (in a business game conducted by accounting students) the demand for particular items (which they could purchase for money), and the effects of these items on the quality of forecast price movements and resultant investment decisions.[23] The study was inconclusive and, to a great extent, artificial; the only firm evidence being that industry information was used more widely than individual company information, and that accounting information did appear to help in the making of investment decisions.

Each of the above research studies is inconclusive in its results, either being unrepresentative or too much at variance with the 'real' world. What they all indicate, nevertheless, is that certain types and items of accounting information are better motivating factors than others.

3. *Perception and accounting*

Despite the obvious importance of perceptions in relation to accounting, there have been remarkably few writings on the subject. In 1964, Soper and Dolphin applied the Flesch Readability Index to corporate financial reports, and found that, over time, these communications had become less and less readable and thus, less and less comprehensible.[24] If this is generally the case, then it appears that the usefulness and relevance of published accounting information as a stimulus to investors' behaviour is seriously diminishing. In 1969, Fertakis developed this theme, warning that the increased disclosure of accounting information in published reports need not necessarily be increasing the latter's usefulness, because human beings are known by psychologists to be capable of perceiving only a limited number of objects at any one time.[25] Indeed he went on to state that 'a hypothesis might be stated with respect to present reporting practices that the greater the amount and diversity of accounting data to which the user is exposed, the greater is the potential for misunderstanding, confusion, and hindrance to rational investment action'.[26] This brought a rejoinder from Jensen (appropriate if, nevertheless, somewhat misconstruing the message of Fertakis's paper) describing the dangers of indiscriminately applying psychological findings to accounting without empirically testing their applicability.[27] In 1971, Smith and Smith researched further into the readability problem in the communication of accounting information and, limiting their study to the footnotes in financial statements, revealed that the messages contained in the latter were understandable only to a limited audience of a very high educational level.[28] The implications of these findings for a great many

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[20] George R. Benston, 'Published Corporate Accounting Data and Stock Prices', *Empirical Research in Accounting: Selected Studies 1967*, pp. 1–54.

[21] Ralph W. Estes, 'An Assessment of the Usefulness of Current Cost and Price-Level Information by Financial Statement Users', *Journal of Accounting Research*, Autumn 1968, pp. 200–207.

[22] Vincent C. Brenner, 'Financial Statement Users' Views on the Desirability of Reporting Current Cost Information', *Journal of Accounting Research*, Autumn 1970, pp. 159–66.

[23] Lyn D. Pankoff and Robert L. Virgil, 'Some Preliminary Findings from a Laboratory Experiment on the Usefulness of Financial Accounting Information to Security Analysts', *Empirical Research in Accounting: Selected Studies 1970*, pp. 1–61.

[24] Fred J. Soper and Robert Dolphin, Jnr., 'Readability and Corporate Annual Reports', *The Accounting Review*, April 1964, pp. 358–62.

[25] John P. Fertakis, 'On Communication, Understanding, and Relevance in Accounting Reporting', *The Accounting Review*, October 1969, pp. 680–91.

[26] op. cit., p. 689.

[27] Robert E. Jensen, 'Empirical Evidence from the Behavioral Sciences: Fish Out of Water', *The Accounting Review*, July 1970, pp. 502–8.

[28] James E. Smith and Nora P. Smith, 'Readability: A Measure of the Performance of the Communication Function of Financial Reporting', *The Accounting Review*, July 1971, pp. 552–61.

'lay' investors and managers are rather obvious.

4. *Attitudes and accounting*

Very little work has been conducted into the impact of accounting information on attitudes, and vice versa. Indeed, the only significant work in this area has been by Cook. In 1967, she conducted a business game with students in which she attempted to assess the effect accounting reports on management performance had on the attitudes of the participants towards their role in the game; this being measured in terms of personal satisfaction and interest.[29] She tentatively concluded that the feedback of accounting information improved the quality of performance of the participants. This study, however, evoked a response from a psychologist with an active interest in accounting (Becker) who complained that studies such as Cook's may help the development of accounting thought but did little to advance the development of psychology, thereby limiting their usefulness.[30] Cook later developed her research more into the 'real' world and, in 1969, surveyed certain business managers (mainly middle-management) to assess their attitudes to feedback performance reports in business.[31] She found from this study that these reports should be communicated as frequently as possible; should emphasise favourable as well as unfavourable performances; and should give detailed reasons for any criticisms made of performance.

5. *The corporate personality in accounting*

One particular area of behavioural accounting, which has strong psychological foundations, concerns the existence of a 'corporate personality' in an individual business. This is reflected in managerial attitudes, tolerances, conservatism, optimism, and so on. Sorter and Becker carried out a preliminary investigation of this phenomenon in 1964, and found that it did appear to exist, and that it was capable of influencing accounting decisions – for example, in relation to the type of depreciation methods used; a conservative management using a method likely to produce a conservative measure of accounting profit.[32] In 1966, the same team conducted more intensive research in this area, coming to the same conclusions with regard to both depreciation methods and inventory valuations.[33] This work is of vital importance to accounting because it indicates that accounting measurements for information reporting purposes can be influenced by psychological factors as well as by business and economic factors.

6. *The effect of alternative accounting techniques*

An area of great interest to accounting researchers has been the possibility that the use of differing accounting techniques in the measurement of information describing business profitability and financial position can produce differing measures of these factors and, in time, can cause significant variations in managerial or investment decisions. For this reason, Bruns attempted to find out whether different inventory valuation methods could cause different managerial decisions.[34] In a business game situation, he found, after statistically analysing the results, that there did not appear to be any such relationship of a significant nature. In 1964, Dyckman (the foremost researcher in this area) conducted a similar exercise to that of Bruns, giving the game participants identical accounting information except for the use of different inventory valuation methods.[35] The participants were required to make certain managerial decisions on the basis of this information. The decisions were analysed, and it was found that there was evidence, at least in this study, to suggest that the use of different inventory valuation methods would *not* cause differing decisions. Dyckman followed up this study, in 1966, again with a business game, testing the effect of differing inventory methods for information measurement on the decision to purchase a business.[36] The results of this study revealed rather more indication of significantly different decisions than the previous studies.

What the above, and other similar studies referring to the effect of alternative accounting techniques, suggest is that (*a*) it is extremely difficult to stimulate a 'real' world situation in behavioural accounting research, and this lack of 'real' world atmosphere can seriously affect the validity of research results; (*b*) at the present time, it is unreal and irrational to try and completely isolate the effects of accounting information on decisions because it is only part of the total information influencing decisions and actions; and (*c*) research evidence does reveal that accounting information acts as a stimulus to behaviour, but that it is difficult, if not impossible, to precisely measure the efforts.

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[29] Doris M. Cook, 'The Effect of Frequency of Feedback on Attitudes and Performance', *Empirical Research in Accounting: Selected Studies 1967*, pp. 213–24.

[30] Selwyn W. Becker, 'Discussion of the Effect of Frequency of Feedback on Attitudes and Performance', *Empirical Research in Accounting: Selected Studies 1967*, pp. 225–8.

[31] Doris M. Cook, 'The Psychological Impact of Certain Aspects of Performance Reports', *Management Accounting* (UK), January 1969, pp. 8–14.

[32] George H. Sorter and Selwyn W. Becker, 'Corporate Personality as Reflected in Accounting Decisions: Some Preliminary Findings', *Journal of Accounting Research*, Autumn 1964, pp. 183–96.

[33] George H. Sorter, Selwyn W. Becker, T. R. Archibald and W. Beaver, 'Accounting and Financial Measures as Indicators of Corporate Personality – Some Empirical Findings', *Research in Accounting Measurement*, eds. Robert K. Jaedicke, Yuji Ijiri and Oswald Nielsen, American Accounting Association, 1966, pp. 200–210.

[34] William J. Burns, Jnr, 'Inventory Valuation and Management Decisions', *The Accounting Review*, April 1965, pp. 345–57.

[35] Thomas R. Dyckman, 'The Effects of Alternative Accounting Techniques on Certain Management Decisions', *Journal of Accounting Research*, Spring 1964, pp. 91–107.

[36] Thomas R. Dyckman, 'On the Effects of Earnings-trend, Size and Inventory Valuation Procedures in Evaluating a Business Firm', in *Research in Accounting Measurement*, eds. Robert K. Jaedicke, Yuji Ijiri and Oswald Nielsen, American Accounting Association, 1966, pp. 175–85.

7. *The behavioural foundations of management accounting*

So far in this section of the paper, much of the material referred to has been concerned mainly with the financial rather than the management accounting function. However, it is in the area of management accounting (and particularly budgeting) that the greatest amount of research and thought has been directed so far *vis-à-vis* the behavioural sciences. This and subsequent sections attempt to reflect these efforts.

In 1966, Caplan strongly criticised the out-moded foundations of management accounting practices, particularly those of a behavioural nature.[37] He complained that these foundations (taken from economic and organisational theory) based management accounting on such traditional behavioural assumptions as (*a*) the main business objective is profit maximisation; (*b*) workers are basically lazy and inefficient; (*c*) work is unpleasant; and (*d*) management's main tasks are to maximise profits and to control lazy and inefficient workers. He claimed that this meant management accounting systems were being used to try to achieve out-of-date business objectives relating to overall profitability and punitive control, and that this could be to the detriment of the business. He urged management accountants not to base their systems on such authoritarian lines but, instead, to take more cognisance of the behavioural aspects of business and management, and particularly to recognise the needs, drives, motives and anxieties of the human beings in this process. Thus, he suggested, management accounting systems should be based on contemporary organisational theory – for example, concentrating on the goals of the individuals in the business; aiding decision making and communication; recognising the complexities and adaptivity of the goals related to the business; and recognising the limited perception and awareness of individual managers and employees. In other words, using accounting to influence rather than authoritatively control behaviour.

Caplan followed up his logical argument by a questionnaire/interview study of business managers to assess how widely the traditional model of management accounting (based on profit maximisation and punitive control concepts) was applied.[38] His findings revealed that the managers interviewed were very much influenced by the profit maximisation goal, and by the need to have strong control over what they believed to be a lazy and inefficient labour force. Caplan concluded by pointing out the consequences of such a traditional system – that is, the possibility of creating employee hostility, conflict, inefficiency and indifference.

In 1971, McRae elaborated on the previous work of Caplan, emphasising that human beings can be the most important resource in a business, and that accounting should exist to modify and influence the human behaviour in it.[39] He pointed out several of the main criticisms of accounting (particularly management accounting) by behavioural scientists – for example, that accounting is based on an obsolete model of business behaviour (as indicated by Caplan); that it ignores the psychological state of the organisation, including employee and managerial morale; and that conventional accounting systems are punitive rather than supportive. Management accounting, he concluded, was causing resentment, etc. within the organisation which could materially affect its long-term survival.

8. *Behavioural implications of budgeting*

Perhaps the best developed area of management accounting from the behavioural point of view has been business budgeting. The first important study was by Argyris in 1952, when he attempted to analyse the effect of budgets on supervisors in business; and, in particular, the effects of budget pressure, and the use of budgets to express leadership.[40] Since then, several writers have developed and clarified points made in the Argyris study. The following are thought to be a representative selection.

In 1966, Wallace pointed out that budgeting, as part of an overall system of accounting, was intended to be a motivating factor or stimulus in business, and that cognisance should be taken of the harmful effects it can have on behaviour – for example, the fact that concentration on the punitive aspect of control through budgeting can create pressure, complaint, unrest, and stifle initiative.[41] He advocated participation by managers and employees in the budget process (particularly in the setting of budgets), in order to raise morale, encourage initiative, and make business goals more widely known. Becker and Green had investigated the problem of budget participation previously, in 1962.[42] Emphasising the gradual introduction of employee and manager participation in the budget process, they emphasised that such participation acted as a motivating force to better performances, more initiative, and higher levels of morale in business. However, they went on to state that this situation can only come about if (*a*) the participation is real rather than pseudo (that is, those persons concerned should be involved actively in making decisions rather than in merely discussing them); (*b*) participation is a controlled democracy with some form of defined leadership; and (*c*) there is adequate feedback of performance describing both success and failure. The Becker and Green philosophy was, therefore, that realistic participation in budgets increased employee morale, and thereby increased productivity. They warned, however, that budgetary participation should not be regarded as a panacea in relation to morale and productivity. This view of participation evoked a strong criticism from Stedry who, whilst agreeing that it was not a panacea, pointed out that there was a lack of specific evidence to support the participation – morale – productivity relationship.[43]

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[37] Edwin H. Caplan, 'Behavioral Assumptions of Management Accounting', *The Accounting Review*, July 1966, pp. 496–509.

[38] Edwin H. Caplan, 'Behavioral Assumptions of Management Accounting – Report of a Field Study', *The Accounting Review*, April 1968, pp. 342–62.

[39] T. W. McRae, 'The Behavioural Critique of Accounting', *Accounting and Business Research*, Spring 1971, pp. 83–92.

[40] Chris Argyris, *The Impact of Budgets on People*, The Controllership Foundation Inc, 1952.

Conclusions

The intention of this paper was not to put forward any new ideas, nor to specifically criticise old ideas. Instead, its aim has been to indicate to accountants and business managers alike that accounting is a service which involves *people*. Much of the research and thought devoted to a greater understanding of this involvement has been tentative and, at times, unreal. Nearly all of it, however, has indicated the need for more research and more understanding. The future of accounting may well depend on such work rather than on the somewhat sterile arguments about specific methodology. Accountants and managers who ignore the impact of behaviour on accounting, and accounting on behaviour, may well be unwittingly hampering the future development of the discipline.

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[41] Michael E. Wallace, 'Behavioral Considerations in Budgeting', *Management Accounting* (USA), August 1966, pp. 3–8.

[42] Selwyn W. Becker and David Green, Jnr, 'Budgeting and Employee Behavior', *The Journal of Business*, October 1962, pp. 392–402.

[43] Andrew C. Stedry, 'Budgeting and Employee Behavior: A Reply', *The Journal of Business*, April 1964, pp. 195–202.

Frequency of Performance Reporting and Managers Reference for Control – a note

R. Beresford Dew and Kenneth P. Gee

A control report, for present purposes, may be defined as a formal statement of performance for comparison with a predetermined standard, budget or similar yardstick. This standard or yardstick may be present within the report itself, e.g. performance against a budget; but not all control reports reproduce the budgets or targets, and a report may well refer to actual performance only, leaving the comparison to the recipient.

The analysis and the presentation are frequently determined or influenced by accountants, who are concerned with the ultimate translation of the financial implications.

In most large companies, formal control reports with different degrees of mathematical sophistication, are prepared by various departments on a variety of subjects,[1] and are circulated to a specified list of managers at regular intervals.

In large and diversified companies it becomes increasingly difficult for managers to rely on personal observations. Increasingly, therefore, resources are devoted to the production and analysis of control reports for management purposes.

Studies of the effectiveness of such control information, however, are remarkably few.

In 1968, a US study by Cook asked 134 managers in 59 companies to rank on a scale their attitude toward the control reports they received. The findings may be summarised as follows:

> The attitudes of managers toward control reports, as measured by the ratings given to the reports, are directly related to the frequency with which the reports are provided, the average of the ratings given to the control reports received by the participating managers being highest for daily reports and lowest for annual reports.[2]

This study suggests that frequency of provision is the most critical factor, determining whether or not managers find their reports useful for control purposes. If it is true, this has very important implications for management accountants who have to produce vast amounts of information for managers. But is it true?

In the course of a larger study, concerned with the choice of subject matter in management control systems, the authors tested these findings by a study within British companies.

Before presenting the results, it should be noted that this study differed from the USA study in three respects. First, the US study employed a mail questionnaire. In this British study, personal interviews on written questionnaires have been preferred. Second, the US study relied on two or three managers only in each of a large number of companies. In contrast, the British study included only seven companies,[3] but within those companies carried out 65 interviews with control information producers, and 64 interviews with the line managers receiving the control information.

Third, the US study considered the general attitudes of managers toward their control reports, while the British study was concerned with the extent to which managers referred to their reports for control purposes.

The relationship between the frequency with which an item of control information[4] was provided and the use made of that item is shown in Table 1.

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[1] Thus a report from the accounts department on factory expenses, a sales report analysed by product group, quality control reports, absenteeism reports from the personnel department, production control reports concerned with progress of work against a schedule.

[2] Cook, Doris M. 'The Impact on Managers of Frequency of Feedback', *Journal of the Academy of Management*, Vol. XI, No. 3, September 1968, p. 273.

[3] These seven companies were all manufacturers, and were all located in the North and Midlands of England. Each company was in a different industry, the industries concerned being the production of fibre products, abrasives, diesel engines, cars, paint, batteries and storage radiators.

The results resemble the US findings, in that the items of control information provided most frequently were also those which were used most extensively.[5] In both studies, US and British, on the whole there was less reference by managers to the items of control information which are provided relatively rarely.

But there are alternative explanations, i.e.

(a) There were defects or other reasons why some control information was referred to less frequently – not related to any excessive length of reporting interval.

(b) The control information was less useful when and because it was provided relatively infrequently.

TABLE 1

The relationship between the use made of an item of control information and the frequency with which that item was provided

Frequency of Provision	*No. of items considered to be relevant and useful*	*No. of items considered to be irrelevant or background information*
Daily	31	3
Weekly or fortnightly	100	61
Monthly	149	163
Quarterly	22	22
Half-yearly or annually	6	16
	308	265

Notes

1. There were 22 items of control information for which the data obtained was insufficiently clear for classification.
2. Of the 161 items of control information provided weekly or fortnightly, seven were fortnightly.
3. Of the 22 items of control information provided half-yearly or annually, seven were half-yearly.

The US findings implied a simple acceptance of the second hypothesis without reference to the first possibility. In the British study, the managers who received the information were asked why they did not refer to certain items for control purposes; and their answers were then compared with the frequency of provision of those items, to see whether failure to refer, due to infrequency of provision, increased as the reporting intervals grew longer. Had this been so, it would have tended to confirm the US hypothesis.

The findings obtained are shown in Table 2; and it is clear that the items of management control information with relatively long reporting intervals were no more prone to a low degree of utilisation as a result of infrequent provision than items of control information with shorter reporting intervals.

There was no evidence that items of control information provided relatively infrequently were less used *because* they were less frequently provided. The data will not support the implications of the US study that frequency of provision is critical in determining whether or not managerial use is made of an item of control information.

The authors found that nearly half the items of control information produced in the British companies were not used by the managers who received them. The most frequently encountered reason given for this was that the information related to matters outside the control of the receiving managers.[6]

TABLE 2

The relationship between the reasons given for not using an item of control information and the frequency with which that item was provided

Frequency of provision (reporting interval)	*No. of items said to be irrelevant because of infrequency of provision*	*No. of items said to be irrelevant for other reasons*
Daily or weekly	23	37
Fortnightly or monthly	51	116
Quarterly	6	16
Half yearly or annually	1	15
	81	184

Notes

1. Of the sixty items of control information provided daily or weekly, three only were daily.
2. Of the 167 items of control information provided fortnightly or monthly, four only were fortnightly.

Many other reasons were also given; but the authors have no evidence from their studies in management control information in British companies to support the suggestion of the US study that the frequency with which management is given control information determines the degree to which management will use it for the purposes for which it was designed.

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[4] An item of control information is a measure of the value of a variable which managers wish to control. A control report may contain more than one item of control information, as for example where a production report shows both waste losses and the percentage of substandard goods produced.

[5] This may be verified statistically by the application of a chi-square test with four degrees of freedom. A value for chi-square of 34·3 is obtained, which is significant at the 5 per cent level.

[6] The implications of widespread differing of views as to the precise nature of the managers' responsibilities were confirmed by other extensive studies in these British companies.

Contributors to Accounting and Business Research

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Editorial

THIS issue of *Accounting and Business Research* completes the second volume. The journal is now established on a regular quarterly basis and its circulation is steadily increasing in the United Kingdom and throughout the world. The flow of articles submitted for publication is such that space cannot be found for all of them. It is regretted that articles, often of considerable merit, have had to be returned. But space can always be found for work of outstanding quality whether from the academic world or from business, the latter being particularly welcome.

Accounting and Business Research has benefited from generous offers of prizes to be awarded for contributions of particular merit. A first prize of £250 for an article on **Inheritance Tax**, has been made available through a grant from the P. D. Leake Committee, with a further prize of £50 for the article judged second best, and payment at normal rates for the third best. The original closing date for the competition, 31 July, has been extended until 30 September, but as announced in the Summer issue, entries of sufficient merit received before the end of August qualified for publication in the Autumn issue. The entry by **Mr R. M. Walters of Bristol,** printed on pages 253–63 of this issue, was in fact received before the end of July and is the outstanding article so far. Further prizes may still be awarded for articles of sufficient merit received by the revised closing date of 30 September.

The R. G. Leach Fund Award of £100 for an article, on any subject, published in the journal in 1972, remains open. The award will be in addition to the normal fee paid for articles in *Accounting and Business Research.* Originality and relevance to current financial problems will be taken into consideration.

A Profile of Industrial Acquisitions in 1971

Adrian Buckley

Growth by acquisition is now well established in many UK companies as an integral aspect of corporate strategy. From the standpoint of the shareholder, the impact of an acquisition upon a company's reported earnings is difficult to assess. Frequently, following a takeover the new subsidiary is reorganised, with parts being integrated into previously existing divisions of the holding company. If the published accounts show divisional profits, the investment analyst can do little beyond guessing the impact of the acquisition. In most cases, studying files at Companies House adds little because reorganisation of the acquired company precludes comparison of results before and after takeover. And, of course, revaluation of assets, changes in depreciation policy, revised accounting treatment of profit on long-term contracts and the like make comparative analysis difficult, if not impossible.

The reasons generally put forward to justify the pursuit of the strategy of expansion by acquisition include:

> the fact that acquisition may increase market share and reduce competition.
>
> the need to diversify; for example Imperial Tobacco's move into various food interests.
>
> the fact that acquisition is often the quickest or only way into an industry, for example into a mature oligopoly; an instance here is Grand Metropolitan Hotels' takeover of Trumans.
>
> the belief that larger production and marketing units are more economically viable.
>
> the belief that the acquirer can better utilise the assets of the takeover candidate.
>
> the argument that the company on a high p/e multiple can enhance short-term earnings per share by acquisition of companies on lower multiples.
>
> to obtain wider geographical coverage.
>
> to buy the management.

Some observers[1] have commented that excessive emphasis appears to be placed in discussion on mergers upon economies of scale. Perhaps this reflects the influence of public relations departments, rather than business realities. Certainly the theory of widespread synergy – a concept much abused by the 'puffery' and notions of super-management which abounded in the heyday of the American conglomerate – as an easily released gain in takeover situations has been challenged. Indeed it seems[2] that synergy is most easily won in financial areas – for example, through raising debt on previously uncharged assets.

At the core of every acquisition should be the financial objective of enhancing the present value of the equity shareholders' stake in the firm. Given the link between growth in earnings per share and stock market valuation, the position is summed up by the chairman of Slater Walker Securities[3] as follows: 'Slater Walker acquires other companies for one basic reason: to increase the purchasing company's assets and future earnings per share. In my opinion, this principle should be applied by all companies seeking to acquire other companies.' However, many writers, having observed organisational behaviour where ownership and control are divorced, have suggested that the motives of managers in pursuing an acquisition strategy may not necessarily be in line with improving the shareholder's lot. For example

---

[1] Michael Gort, 'An Economic Disturbance Theory of Mergers', *Quarterly Journal of Economics*, November 1969.

[2] John Kitching, 'Why do Mergers Miscarry?', *Harvard Business Review*, November-December 1967.

[3] J. D. Slater, 'The Acquirer's View' in *What is Profit?*, The Institute of Chartered Accountants in England and Wales, 1970.

Baumol[4] states that 'management's goal may well be to maximise "sales" (total revenue) subject to a profit constraint'. Edith Penrose[5] observes that managers are vitally interested in growth of the firm because they 'gain prestige, personal satisfaction in the successful growth of the firm with which they are connected, more responsible and better paid positions, and wider scope for their ambitions and abilities'. These comments are substantiated by empirical tests undertaken by Samuel Richardson Reid[6] whose study based on USA companies led him to the conclusion that 'the major hypothesis tested in this study – that those firms which merge tend to be more orientated to managers' interests than to shareholders' interests – appears to have been true for large American industrial firms during the period examined'. As Richardson Reid[7] comments, 'there is a great difference between profits being the objective and being merely a constraint'.

It is possibly true that in those organisations where managers own large stakes in the equity of their companies there is a greater likelihood of financial criteria beneficial to the shareholder affecting expansion strategy, as opposed to the situation where ownership and control are divorced. It may further be argued that if manager and shareholder objectives are not necessarily compatible, it is hardly surprising that commentators[8] of merger activity find that acquiring companies frequently pay over and above the true economic value in the heat of takeover bids.

On the other side of the equation, that is from the standpoint of the takeover candidate, the avoidance of involuntary takeover is regarded[9] by Marris as being one of the key motives of managers. Marris goes further than this when he develops the idea that takeovers most frequently occur when management fails to maintain an acceptable valuation ratio (i.e. the ratio of the market value of equity capital to the book value of equity assets). On this theory, bids would most likely occur when the valuation ratio of the victim falls below unity – in stock market nomenclature the asset situation. Of course, the true value of a company's assets may not necessarily be reported in the balance sheet, given that assets may be at historic cost (of those companies taken over in 1971, Buck & Hickman, acquired by Sterling Guarantee Trust, is an excellent example. It transpired that the market value of equity assets was 603p per share compared with a book value of 253p).

In fact Newbould's[10] study of merger activity in 1967 and in 1968 fails to endorse the Marris theory. Looking at the valuation ratio of biddee companies at a date one month before the first announcement of the intention to bid, Newbould found (for bids exceeding £10 million consideration) that only 11 out of 74 takeover victims had valuation ratios of less than unity. Indeed the average valuation ratio of Newbould's sample was 1·96 compared with an average for all quoted companies of 1·5 to 1·6 during the period of his analysis. This finding conflicts with the empirical work of Kuehn[11] who demonstrated that companies with lower valuation ratios are more likely to experience a bid and are more likely to be taken over than companies with higher valuation ratios.

One would have thought, intuitively, that companies with low valuation ratios would be more attractive as victims of bids from acquisitive companies; it is no secret[12] that many active acquirers like to limit the downside risk in a takeover situation and one easy way to do this is to ensure that the candidate company is rich in asset backing.

Perhaps the fact that Newbould's study spanned a major bull market partly explains his finding, because clearly when stock market prices in general are higher, then the tendency is for valuation ratios similarly to be greater. However this does not explain the fact that the average valuation ratio of companies bid for was greater than the average for all companies.

Others have advanced and tested theories as to the characteristics of takeover target companies. Samuels and Tzoannos[13] questioned whether, in fundamental terms, takeover candidates tend to be undervalued. They concluded that, on the basis of the price one month before the bid, this is frequently so. But they further found that, at subsequent acquisition prices, undervaluation is not the case; indeed, on the evidence of their small sample, the tendency may be towards too high a price.

In the 1967 sample used by Rose and Newbould,[14] the purchasing company was almost always larger than the company being acquired, but in profitability terms bidder and biddee showed no distinct pattern. Furthermore, following the evidence of a Board of Trade inquiry for 1954 to 1961, which showed that candidate companies tended to be weaker in liquidity terms than the bidding company, Rose and Newbould tested this with respect to 1967 takeovers – in fact they found the reverse to be the case.

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[4] William J. Baumol, 'On the Theory of the Expansion of the Firm', *American Economic Review*, December 1962.

[5] Edith Penrose, *The Theory of the Growth of the Firm*, Basil Blackwell, 1959.

[6] Samuel Richardson Reid, *Mergers, Managers, and the Economy*, McGraw-Hill, 1968.

[7] Ibid.

[8] G. D. Newbould, *Management and Merger Activity*, Guthstead, 1970.

[9] Robin Marris, *The Economic Theory of Managerial Capitalism*, Macmillan, 1964.

[10] G. D. Newbould, *op. cit.*

[11] D. Kuehn, 'Stock Market Valuation and Acquisitions: An Empirical Test of One Component of Managerial Utility', *The Journal of Industrial Economics*, April 1969.

[12] John Bentley interviewed by James Millen, 'Fortune from Fundamentals', *Accountancy*, May 1972.

[13] J. M. Samuels and J. Tzoannos, 'Takeovers and Share Price Evaluation', *Business Ratios*, No. 2, 1969.

[14] H. B. Rose and G. D. Newbould, *The 1967 Takeover Boom*, Moorgate and Wall Street, Autumn 1967.

Gort[15] tested and found some support for the hypothesis that 'discrepancies in valuation are decisive in determining variations in merger rates both among industries and over time'.

Vance[16] has gone as far as to propose a points rating means of assessing whether companies are vulnerable to takeover. According to his proposition, danger signals are high liquidity, low gearing, low price/earnings ratio and poor earnings growth. Although he gives scores on all of these factors, his methodology in arriving at these ratings is not obvious.

Clarkson and Elliott[17] point out that 'a firm attracting a takeover bid is most likely to be suffering from one of the noted deficiencies', which are reported as excess liquidity (in contrast to the Board of Trade analysis), poor control of receivables, a low volume of debt, overinvestment in fixed assets, and slow earnings growth.

As to the timing of merger activity, studies have been undertaken by various investigators[18] and it appears that the peaks and troughs in merger activity are in sympathy with the level of industrial stock prices and money supply. This would make 1972 an intensive merger time.

The analysis

What this paper does is to study 1971 acquisitions in the UK with a view to identifying whether companies taken over tend to possess a series of characteristics symptomatic of acquisition candidates in general.

On the basis of various writers' suggestions it seems worth while to test whether certain features regularly occur in acquired companies. Thus it is proposed to analyse takeover target companies from the standpoint of:

their valuation ratio

their earnings over recent – the last three – years (given that business cycles occur, if a company is diversifying timing is of essence, and when earnings are in a trough may be the right time to buy).

their price/earnings ratio

their liquidity

their gearing

Each of these characteristics is looked at in turn for the sample of 1971 industrial acquisition candidates. The analysis is in terms of one variable at a time; to this extent there are clear limitations because it does not show the interaction between financial indicators, nor the weights that should be attached to each variable. Statistical analysis would be a valuable addition to the work undertaken; however this has not yet been attempted.

The sample comprises quoted companies which were the subject of a resolved, successful or otherwise, takeover bid and the consideration exceeded £2½ million. The bid for Glaxo, still in the hands of the Monopolies Commission at the time of writing, is thus excluded. Sales of part of a group – for example the sale by Slater Walker Securities of its Crittall-Hope subsidiary to Butterley Engineering – are excluded, as are purchases of non-quoted companies (this rules out Booker McConnell's acquisition of Sheppey Trust). Bids by UK companies for overseas companies are also excluded, so that the ICI bid for Atlas Chemical is not within the confines of this analysis, but bids by overseas companies for UK quoted groups are within this study, e.g. St Regis Paper of New York's bid for Tillotson & Son. Bids for minority shareholdings (that is where the bidder is already the parent) are also excluded. Examples here include Coats Patons' bid for the outstanding minorities in Pasolds and West Riding Worsted and Woollen, Barclays Bank's bid for the minority of Barclays DCO, and S. Pearson's bid for the minority of Penguin Publishing.

It has also been the intention in the study to concentrate on industrial bids; this means that takeovers in the following categories are excluded:

bids for finance groups, e.g. the C. T. Bowring takeover of Singer and Friedlander

bids for insurance companies

bids for property companies (where underlying asset value is almost always the key criterion)

bids for investment trusts, which may be in the nature of rights issues in disguise

bids for gaming groups, e.g. the Mark Lane/J. Coral merger and J. Coral Holdings' bid for Curzon House

---

[15] Michael Gort, *op. cit.*

[16] Jack O. Vance, 'Is your Company a Takeover Target?', *Harvard Business Review,* May–June 1969.

[17] G. P. E. Clarkson and B. J. Elliott, *Managing Money and Finance,* Gower Press, 1969.

[18] R. L. Nelson, 'Business Cycle Factors and the Choice between Internal and External Growth', in *The Corporate Merger,* edited by W. W. Alberts and J. E. Segall, Chicago University Press, 1966.
Samuel Richardson Reid, *op. cit.*

This leaves 65 bids for industrial groups (broadly classified), although in many of these property considerations may have been of essence, e.g. Solicitors' Law Stationery, Buck & Hickman, Edward Webb & Sons (Stourbridge), Wharf Holdings.

The breakdown of these bids between successful and unsuccessful takeover attempts is shown in Table 1; this shows that the majority of bids are agreed ones.

In respect of those cases where control of the takeover target company was acquired, the average premium compared with the stock market price one month before announcement of intention to bid was 63 per cent. This statistic is clearly an overall one, and dependent upon the circumstances surrounding the takeover, distinct differences are evident. For agreed bids the average premium was 45 per cent; for those contested by directors the average premium was 71 per cent; for those contested by third parties the average premium was 111 per cent. One caveat should be made in respect of the last figure. Tarmac's bid for Limmer involved a substantial premium – one month before the bid the Limmer price was 18p compared with the price which Tarmac had to pay to gain control, which was near 73½p – and this clearly affects the figures considerably. Indeed if the Tarmac/Limmer bid is excluded, the average premium in respect of successful bids contested by third parties becomes 91 per cent. These findings are summarised in Table 2 which also indicates the conclusions reached by Newbould (reported in 'Management and Merger Activity') in his study of 1967–68 acquisitions.

The premium paid is a function of many factors not least of which are:

the agreement of the takeover candidate

whether the takeover candidate can show substantial profit recovery or asset values 'hidden up its sleeve'

TABLE 1
Bids for quoted UK industrial companies – 1971

	Company acquired	*Company not acquired*	*Total*
Agreed bids	34	—	34
Bids contested by directors	11	8	19
Bids contested by third parties	11*	1	12
	56	9	65

* In this category, Venesta International and Keizer Venesta are included. Control of these companies was acquired by Consolidated Signal through purchases in the market 'to protect an investment'. Following a ruling by the Takeover Panel, Consolidated did not bid for the outstanding minorities.

TABLE 2
Ratio of final bid valuation to price four weeks before the bid

	Agreed bids	*Contested by directors*	*Contested by third parties*	*All bids*
This study				
Average ratio	1·45	1·71	2·11	1·63
Variance	0·12	0·13	0·45	0·26
This study – excl. Tarmac/Limmer				
Average ratio	1·45	1·71	1·91	1·59
Variance	0·12	0·13	0·07	0·12
Newbould's study				
Average ratio	1·33	1·77	1·74	1·45
Variance	0·07	0·23	0·07	0·13

the extent of the previous undervaluation

whether the purchaser has been able, as a launching pad, to build up a strategic holding in the takeover target company. This is often achieved as a result of a line of stock coming on offer via a banker or merger broker, alternatively it may have been purchased direct in the market

Generally speaking, the premium in 1971 appears to have exceeded that in 1967–68. Why should this be? Perhaps it is partly explained by the fact that during most of 1971 the stock market was below the level in the Newbould study. Given that one of the defences frequently used in bid situations is the value of equity assets, clearly the lower the level of share prices in general, the greater the premium necessary to match asset value. Alternatively takeover defences may now be more sophisticated.

Another interesting aspect of takeover activity in 1971 was the large proportion of bids which fall outside the description 'industrial logic'. A genuine attempt was made to search out industrial logic in the bids analysed – thus, for example, Allied Breweries bid for Trust Houses Forte and Grand Metropolitan Hotels bid for Truman Hanbury Buxton were both categorised as having industrial logic – nonetheless around 20 per cent were classified as conglomerate takeover attempts, without apparent industrial logic.

Characteristics of takeover candidates

The sample of biddee companies was first examined from the standpoint of their valuation ratio one month before the first announcement of intention to bid. In order to provide a basis for comparison, a further sample of 65 companies not the subject of a takeover bid was obtained. This sample was weighted according to the incidence of acquisitions during the year.

Of those companies bid for during 1971, no less than 27 out of 65, that is 41·5 per cent, had valuation ratios below unity. In the sample which was used as a control only 30·8 per cent had valuation ratios below one.

If, because of undervaluation of book assets, one looked at the proportion of the samples with valuation ratios below 1·25, the respective percentages for the sample of companies bid for and not bid for amount to 53·9 per cent and 38·4 per cent.

The results of this analysis are summarised in Table 3 and Chart 1.

It should be mentioned, in passing, that the author of this paper is aware of at least half a dozen instances among the sample of companies bid for during 1971 where, although on book value considerations the valuation ratio exceeded unity, on realisable value of assets the valuation ratio fell to below one.

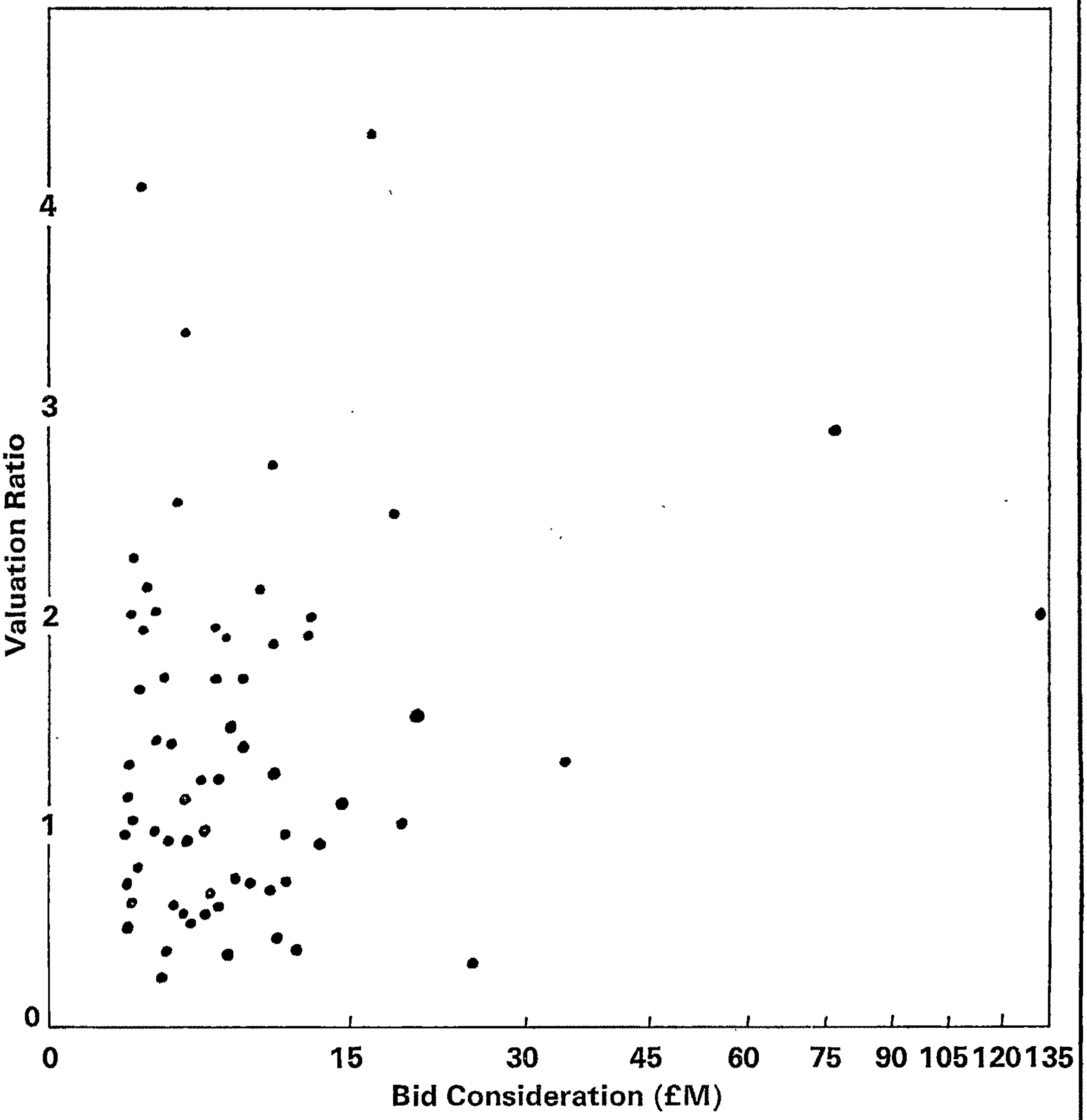
TABLE 3
Valuation ratios – 1971

Summary	*Companies bid for in 1971*	*Sample of companies not bid for*
Upper quartile	1·94	2·29
Median	1·18	1·36
Lower quartile	0·71	0·88
Average	1·38	1·78

	Companies bid for in 1971		*Sample of companies not bid for*	
In detail Valuation ratio	*% of companies with valuation ratio in category*	*Cumulative %*	*% of companies with valuation ratio in category*	*Cumulative %*
below 0·50	10·8		9·2	
0·50–0·75	18·5	29·3	10·9	20·1
0·75–0·90	4·5	33·8	6·1	26·2
0·90–1·00	7·7	41·5	4·6	30·8
1·00–1·10	6·2	47·7	1·5	32·3
1·10–1·25	6·2	53·9	6·1	38·4
1·25–1·50	9·2	63·1	13·9	52·3
1·50–1·75	7·7	70·8	6·1	58·4
1·75–2·00	9·2	80·0	4·6	63·0
In excess of 2·00	20·0	100·0	37·0	100·0
	100·0		100·0	

CHART I

Valuation Ratios of Takeover Target Companies



The results set out in Table 3 tend to endorse the Marris concept that companies with low valuation ratios are in danger of attracting a takeover bid. The asset situation is, of course, well known to the managements of such companies as Adepton, Jessel Securities, Slater Walker Securities, Cavenham Foods, Sterling Guarantee Trust, Drakes, Kent Castings, Cornwall Properties, Ralli International, Hestair, Armour Trust, Kniton Investments, Dowgate & General Investments, Tremletts and Consolidated Signal, whose bids in 1971 accounted for 19 of the 65 analysed.

Earnings performance over recent years was then studied for the sample of 1971 biddee companies. Again to obtain a basis for comparison a sample of companies, which were not the subject of a bid, was analysed. Because two of the 65 companies in the sample had only recently gone public, and therefore had only short quoted records, these were excluded from the sample for earnings analysis purposes.

Looked at over the most recent three years, over 46 per cent of companies bid for in 1971 had falling earnings compared with about 35 per cent for companies in general. The findings of this analysis are presented in Table 4.

The idea that acquisitive companies either time their takeover approach for a candidate company to accord with a setback in earnings of the victim, or the widespread activities of acquirers who are looking for opportunity purchases, these opportunities arising when an earnings setback occurs, is well substantiated by the figures in Table 4. Failure to achieve anything but slow earnings growth may – although this is clearly not always the case – be indicative of a failure to exploit existing opportunities, carrying of loss makers, too large an administrative overhead, or a lack of central management control. In these circumstances the acquirer often believes that he can achieve better results from the assets acquired than the takeover candidate.

The third factor to be studied in terms of its relevance to takeover situations is the price/earnings multiple of the candidate companies. The argument in favour of the acquirer on a high p/e ratio purchasing, with equity, a company on a lower multiple and thus obtaining an immediate boost to short-term earnings per share is well known. If, of course, the p/e ratios of both acquirer and acquired truly reflect their growth potential (leaving aside, for now, the question of risk), the company making the bid may, in these circumstances, experience dilution in its future growth expectations.

For the purposes of comparison the historic price/earnings ratio for each biddee company, as published in the *Financial Times* four weeks before the first announcement of intention to bid, was contrasted with the average multiple at that date for its sector. The sectoral average was extracted from the *Financial Times* – Actuaries share indices which are published daily. All takeover candidates whose last reported results showed losses were excluded from this part of the study. Of the 55 companies left only 18 had a p/e ratio in excess of their sectoral average – the findings are summarised in Table 5.

TABLE 5
Price/Earnings ratio of takeover candidates in comparison with the relevant sectoral average

	P/E ratio of company / *Average P/E ratio of sector*
Upper quartile	1·07
Median	0·83
Lower quartile	0·60

That takeover target companies possess multiples below their sectoral average seems well supported by this analysis.

TABLE 4
Earnings growth or decline over three years to 1971

Summary	*Companies bid for in 1971* %	*Sample of companies not bid for* %
Upper quartile	+32·3	+49·8
Median	+ 1·3	+17·9
Lower quartile	−37·1	−23·7
Average	− 1·1	+16·1

	Companies bid for in 1971		*Sample of companies not bid for*	
In detail	*% of companies in category*	*Cumulative %*	*% of companies in category*	*Cumulative %*
Earnings in year 3 compared with year 1—below 50%	20·7		12·2	
50–60%	—	20·7	1·5	13·7
60–70%	11·1	31·8	4·8	18·5
70–80%	7·9	39·7	7·7	26·2
80–90%	3·2	42·9	6·2	32·4
90–100%	3·2	46·1	3·1	35·5
100–110%	14·3	60·4	7·7	43·2
110–120%	7·9	68·3	9·2	52·4
120–130%	3·2	71·5	7·7	60·1
130–140%	6·3	77·8	7·7	67·8
140–150%	7·9	85·7	9·2	77·0
In excess pf 150%	14·3	100·0	23·0	100·0
	100·0		100·0	

The remaining two factors studied in this paper – liquidity and gearing – may, in themselves, make a target company attractive to an acquirer. Buying a company 'stacked full of cash' may enable the acquirer to redeploy surplus liquid assets in financing future deals. In a somewhat similar manner the assets of the under-geared company may be charged to support further debt. This is one of the sources of financial synergy which, according to Kitching,[19] is the most likely place to find two plus two equalling five. However no very distinct pattern either of excess liquidity or undergearing was apparent in general on examining the companies in the sample.

Taking liquidity – measured in terms of liquid assets (i.e. current assets less stock) to current liabilities – first, the results of calculating the acid test ratio for the sample of acquisition candidates for 1971 and comparing this with the average for all manufacturing and industrial sectors shows no material overall difference. These findings are tabulated in Table 6.

TABLE 6
Ratio of liquid assets to current liabilities

	Sample of companies bid for in 1971	*All manufacturing and industrial companies*
Upper quartile	1·20	1·27
Median	0·92	0·99
Lower quartile	0·79	0·73

On the question of gearing, a slight tendency towards companies with low debt being takeover candidates was identified. Here the analysis of companies bid for in 1971 was undertaken in terms of:

first, gearing for all companies in the sample of industrial companies receiving bids.

second, gearing for industrial companies successfully bid for.

third, gearing for those companies successfully bid for but excluding all asset situations (i.e. valuation ratios below unity four weeks before the first bid announcement).

Results here were compared with a recent profile of gearing in UK industrial companies.[20] To make the findings in the sample conform, in terms of definition, with the average profile, gearing was interpreted as:

$$\text{Gearing}^{*}\ \text{percentage} = \frac{\text{Non-equity funds}}{\text{Total fixed capital}} \times 100$$

Where:

Total fixed capital = Preference capital + equity capital + reserves + long-term liabilities + minority interests + bank overdrafts.
Equity funds = Equity capital + reserves.
Non-equity capital = Total fixed capital — equity funds.

The end-product of the gearing analysis is shown in Table 7 below. If one looks at the columns of figures relating to all companies bid for, and all successful takeovers, there seems little difference between the gearing percentage in these categories and in the average for all industrial companies. However if one leaves aside asset situations, because of their outstanding attraction in themselves, one is left with a sample in which there is some tendency towards undergearing.

TABLE 7
Gearing in biddee companies

	Industrial companies receiving bid in 1971			*Sample of all UK companies*
	All in sample	*All successfully bid for*	*All successfully bid for, excluding asset situations*	
Gearing percentage ranges	%	%	%	%
0–9	16·9	14·3	11·8	19·8
10–19	16·9	19·6	26·5	18·5
20–29	15·4	17·9	23·5	20·0
30–39	18·5	21·4	29·5	16·9
40–49	15·4	16·1	2·9	13·6
50–74	15·4	8·9	2·9	10·6
75–100	1·5	1·8	2·9	0·6

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[19] John Kitching, *op. cit.*

* Gearing is probably better measured by the relationship of short-term plus long-term debt to total capital employed (including debt). The definition used in this paper was chosen to conform with available statistics for industrial companies in general.

[20] David Prusman and George Murphy, 'Gearing in British Quoted Companies', *Business Ratios*, Winter 1968.

Conclusion

At the end of the above analysis the distinct impression is that acquisition candidates frequently possess:

low valuation ratios

declining or static earnings

lower price/earnings ratios than their sectoral average

and there is some slight tendency towards undergearing. No distinct pattern emerges in relation to liquidity.

Indeed looking at the pertinent ratios for takeover candidates in 1971 produces the rather surprising statistic that 53·9 per cent had valuation ratios below 1·25. If biddee companies are further looked at in terms of whether their earnings are fairly static (and for this purpose an increment of under 10 per cent when comparing their most recent figures with results two years earlier was taken) and whether they have price/earnings ratios less than 80 per cent of their sectoral average four weeks before the bid was announced, the 65 industrial companies bid for in 1971 break down as shown in Table 8.

The large number of victim companies with low valuation ratios found in this study contrasts with the comparatively small proportion in Newbould's 1967–68 sample. The preponderance of asset situations is evidence to support Marris' theory. It may also be indicative – as is the large proportion of takeovers without apparent industrial logic – of the activities of a number of aggressive acquirers, to whom the name of the game is building up assets and earnings per share by acquisition. It seems that these financially orientated entrepreneurial companies may now represent a significant force on the takeover scene. Clearly their modus operandi differs from the manager-motivated objectives referred to earlier in this paper.

The conclusion of this study in relation to valuation ratios (*vis-à-vis* Newbould's findings) may reflect a changed emphasis in takeover activity from a concentration on managerial orientated industrial logic acquisitions to more financially motivated takeovers, which may or may not involve industrial logic, designed specifically to exploit better the assets of the acquired. Given the doubt that has been cast[21] upon the widespread presence of economies of scale and the fact that synergy is most likely to be found in financial areas,[22] this is hardly surprising.

TABLE 8

CHARACTERISTICS OF TAKEOVER CANDIDATES - 1971

Valuation ratio below 1.25	Earnings growth below 10% over last two years	P/E below 80% of sector average	No. of biddee companies in this category	
			Coys. bid for	Coys. successfully bid for
✓	✓	✓	7	4
✓	✓	N.A.*	9	8
✓	✓	—	11	11
✓	—	✓	4	4
✓	—	—	6	5
—	✓	✓	5	5
—	✓	N.A.*	1	1
—	✓	—	5	5
—	—	✓	10	8
—	—	—	7	5
			65	56

In this table ✓ means this characteristic applied four weeks before first announcement of intention to bid.— means this feature did not apply. *N.A. means not applicable because company was a loss maker.

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[21] Michael Gort, *op. cit.*

[22] John Kitching, *op. cit.*

[23] Michael Becket, 'Classic Style of the New Breed of Overtakers', the *Daily Telegraph*, 1 May 1972.

In many cases, of course, the valuation ratio according to the balance sheet is not the real asset value and active acquirers are obviously just as interested in this type of situation. Indeed Sterling Guarantee Trust looks for companies 'with most of their real assets not being apparent from the books'.[23] This company's purchase of Buck & Hickman, referred to before in this article, is a good example. So is their purchase of Wharf Holdings. According to the books, Wharf Holdings' valuation ratio one month before the bid was 1·69; at the final bid price it was 1·93. Bought for £6·3 million, but with property potential for redevelopment at Beagle House (in Leman Street, London E1), which received planning permission for office development shortly before the bid (and was subsequently sold for £4·5 million) plus 10 acres on London's South Bank, 2 acres at Wapping and 19 acres at Avonmouth, to say nothing of a tea warehousing and shipping business, the price paid was substantially below real asset value.

Timing of purchase is also of essence to the active acquirer and this is exemplified by the frequency of bids for companies with low or no growth in recent years. It is also borne out by the statement of Jeffrey Sterling of Sterling Guarantee Trust who says 'when to move is a question of timing, for instance, just after a bad result'.[24] Adepton's purchase of Williams Hudson is an example of good timing. Williams Hudson was an asset situation with virtually static earnings; however, with two 250,000 ton tankers going on charter and bringing in an intitial £150,000 in 1971–72 and £300,000 thereafter, profits would have been boosted beyond the £0·8 million of 1969/70.

Another example is Thomas Tilling's purchase of Pilkington Tile. Acquired for the equivalent of 93p per share compared with book value of assets of 82p, at a p/e of 10·6 in January 1971, it is probable that Pilkington's base in the building industry would now make its market value over twice the takeover price. At the time of takeover the *Financial Times* (of 29 January 1971) reported that 'companies connected with the building industry rarely carry high market ratings these days and Pilkington Tile is no exception'.

By and large no clear tendency was identified in respect of liquidity but in relation to capital structure some slight tendency towards undergearing was found. How high liquidity and low gearing can be of value is summed up in the comments of the chairman of Cornwall Properties after the purchase of Edward Webb & Sons (Stourbridge), a company with surplus cash and virtually no gearing – 'Webb has £800,000 in cash following the sale of its garden seeds interests and is sufficient to generate some £3 million in mortgages for property activities.'

The message for companies with low valuation ratios is clear – they are vulnerable to a takeover approach. Those with declining or static earnings and a low price/earnings multiple might also consider themselves in danger. Some sceptical readers may take the view that this is little more than one knew before. Nonetheless it is reassuring that an actual test of the evidence bears out these 'well known' facts.

Taking the acquisition early warning signal as either:

a valuation ratio of 1·25 or below, or

a valuation ratio in excess of 1·25, but earnings growth over the last two years below 10 per cent (in total) and a p/e below 80 per cent of the sectoral average.

and scanning the 600 companies listed in Moodies Investment Digest (excluding companies which are already controlled or one third or more held by directors) produces a list of 73 companies as at May 1972 in the former category and a further 16 in the latter.

If one goes beyond the companies in Moodies Investment Digest clearly the list lengthens. Perhaps financial managers should check, via the valuation ratio (in terms of real asset value), via recent earnings performance and via the stock market rating, that their companies do not have the symptons of takeover candidates.

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[24] Ibid.

An Inheritance Tax in the United Kingdom

R. M. Walters

'. . . But in Heaven's name apply graduation like rational beings and graduate property in proportion to the amount enjoyed and not in proportion to the amount left by those who can no longer enjoy it.'

Mr. Balfour 1894

'The EEC countries, together with Norway and Denmark, have inheritance taxes.'

Government Green Paper 'Taxation of Capital on Death'
Cmnd. 4930. 1972.

The Green Paper entitled 'Taxation of Capital on Death: A possible Inheritance Tax in place of Estate Duty' (Cmnd. 4930) published by HMSO in March 1972 is basically an *exposure draft* containing proposals for an inheritance tax to replace estate duty. An able summary of the contents of this Green Paper by Professor C. T. Sandford was published in *Accountancy* for May 1972. I will therefore not reiterate the details, but will largely take them as read unless further explanation appears necessary. In the same article Professor Sandford also made some comments in order to start the public debate which the Government hopes will follow the publication of the Green Paper. Professor Sandford is the author of a book entitled *Taxing Personal Wealth* (George Allen and Unwin 1971) in which he has explored in depth the workings and shortcomings of estate duty from 1894 and in which he advocates an inheritance tax together with other tax reforms. Because of the depth of his research in the field his views are well worthy of consideration. I am indebted to his book for some of my understanding of the subject.

A cynic might well see in the second of the two quotations stated above a reason for this Government's conversion to the inheritance form of taxation on death. After all estate duty has survived for all its warts, since 1894, and some of its faults were foreseen even in the debates of that year. But while entry to EEC might suggest the need for change we should try to examine the advisability or otherwise of that change dispassionately, and it is my aim in this paper to consider the arguments on both sides.

An examination of a tax reform can only make sense if one first considers what the reform is aiming to achieve, and secondly by what criteria one might judge the effects of the new proposals. If, as it appears, we are aiming to replace estate duty with a new tax because estate duty has certain faults, we can test the new tax by seeing to what extent it corrects them. On the other hand we know that estate duty has certain merits which it would be unwise to lose sight of in our reforming zeal. We should ensure that what merits it has should not be lost in any new system. Lastly we should judge any new proposals against criteria which have become well established for judging any tax and the additional criteria which apply only to a tax on death. All of these points must be borne in mind.

In order therefore to demonstrate the standpoint from which we may view the proposals I will set out baldly both the merits and criticisms of estate duty and the criteria by which I consider the new proposals should be judged. In the rest of the arguments we can use these as reference points.

(*a*) *The merits of estate duty*

1. That it produces a certain amount of revenue (this was approximately £357 million in 1970/71 and is expected to be about £440 million in 1971/72. It represents about $2\frac{1}{2}$ per cent of the total tax revenue of the central government).
2. That it aims to increase social justice by decreasing inherited wealth.
3. That there are other tests of taxable capacity than income, of which capital wealth is the main one, and this capacity is called upon at least once in a person's lifetime.
4. That it is a progressive tax and thus falls more heavily on the rich than on the poor.

5. That from the administration point of view it is relatively easy to collect. The whole of a person's assets have to be systematically collected and valued at death for other purposes, and so the relevant information is already to hand.
6. That it is not an excessive burden, since the deceased has no further use for the funds and the heirs are only being taxed on what they have never yet had.

(*b*) *The main criticisms of estate duty*

1. That it is too high both with respect to marginal and average rates. (This criticism has to some extent been met already by the Finance Bill 1972, but high inflation soon erodes the benefits of reductions in the scales.)
2. That it is too easily avoidable and because of this its incidence is capricious.
3. That it has led in some cases to inefficient use of resources.
4. That it is not graduated according to the correct criteria.

(*c*) *General criteria applicable to all taxes*

1. Equity between taxpayers. (This is a difficult criterion to examine since any particular tax may have to be taken in conjunction with other taxes, so that in conjunction two taxes produce equity whereas separately they do not.)
2. Ease of administration and low collection cost in comparison to revenue.
3. Reasonable possibility of collection and difficulty both of avoidance and evasion.
4. Certainty both in understanding the meaning of the law and in assessing its immediate fiscal consequences.
5. Desirability on social and economic grounds.

(*d*) *Special criteria for a tax on death*

1. That it should not interfere unduly with the administration of the estate.
2. That it should not unwarrantably distort the preferences of the deceased as to the direction of his bequests.
3. That it should not cause any undue hardship or distress to the bereaved family.

It is appreciated that there may be different shades of emphasis in our assessment of some of these criteria and we may have differing principles of resolving conflict where it arises between one criterion and another. These are broadly my views of the tests against which the proposals should be judged and I hope that most readers may be able to acquiesce.

With the criteria in mind discussion of the problem seems to divide into four main parts which we might consider under the headings of dispersion, equity and social justice, administration, and other taxes. I should like to deal with the problem of trusts and settled property separately at the end since this seems to demand a full consideration, although some mention will clearly need to be made in other parts as occasion demands.

Part I Dispersion of Estates

It is generally conceded that estate duty has its place in the armoury of fiscal weapons not primarily to produce revenue, since the revenue from it is very small in comparison to total revenue and could easily be replaced by other means, but as an instrument of social justice. There is a strong feeling, which is not only felt by the poor but has been expressed by some of the very rich, that inherited wealth is not always beneficial to the heir and does not accord with any principle of social justice, since in most cases the right to receive a substantial legacy is based on no merit of the heir but simply on the accident of birth. This justification for estate duty is fairly widely accepted by all but the most right wing of commentators.

It is suggested that an inheritance tax will increase general equality because it will encourage the dispersion of estates. This argument demands close consideration because it is at the root of the proposals for reform.

Let us begin by considering how estate duty operated in this respect. Estate duty as we know has had a number of exemptions which have been well used by estate planners to reduce the burden of the duty. These include gifts of less than £500 per person, gifts out of normal expenditure, gifts in consideration of marriage and some insurance policies. The use of some of these, especially the first, may have encouraged dispersion to a slight extent, but in fact most of them, as can be seen, simply provide means of passing parts of the estate free of duty to the same people who would inherit them after death in any case. Apart from these few reliefs estate duty does nothing to encourage dispersion of the estate over a wider class of beneficiaries. In fact in recent years any kind of dispersion has been positively discouraged because it leads to avoidance of estate duty. The gifts *inter vivos* period has been lengthened, MWPA insurance policies are now aggregable, accumulation and discretionary trusts have become liable to duty and so on. Thus the tendency of all these provisions is to persuade the testator to hold on to all his assets so that they can bear their full share of duty on his death. Once this has occurred there is no additional cost incurred in leaving the whole estate to one person rather than to several.

Estate duty does not then encourage dispersion of an estate to a wide circle of beneficiaries. Its nature is to confiscate for the State a portion of the estate and then to leave the rest to pass as the testator desires. It is a tax which is particularly well designed for a society where the right of primogeniture prevails. It does not encourage a wealthy man of his own accord to spread his estate among the people except in the few cases of works of art, land for the National Trust and donations before death to charity. The public only benefits indirectly because a proportion of the estate goes into the Revenue's coffers. This tendency can further be observed in that there is now a much larger proportion of land held by public corporations than formerly. Estate duty may be only partly responsible for this, but *a priori* it would appear to assist the tendency rather than hinder it.

Estate duty has broken up estates undoubtedly, but this is because they have in some cases had to be sold to pay the duty, but if the duty can be paid in any other way then estate duty does not encourage the break-up of wealth.

Inheritance tax on the other hand does have the characteristic that it would appear to favour dispersion of estates by testators. One should not stress this unduly because most testators intend to benefit a limited number of persons in any case and will not be easily moved to alter those intentions for fiscal considerations. However where a testator is undecided or has a fairly wide choice he obviously would take tax into account, and if tax could be reduced by leaving to grandchildren rather than children then this might tend to happen since the children still benefit indirectly. This is known as 'generation-skipping' and was to some extent practised under estate duty but it might be even more beneficial under an inheritance tax.

This tendency to dispersion has some interesting ramifications. Firstly is dispersion desirable in this form? The fact that a testator divides his estate between three children rather than leaving it wholly to one will certainly increase equality and reduce inherited wealth. But it is open to doubt whether the increased dispersion among the class of persons likely to benefit is sufficient really to satisfy the egalitarians. We shall need to decide whether or not we prefer confiscation for the public benefit or fiscal encouragement to spread the estate among rather more of the privileged beneficiaries than formerly.

The next point is whether dispersion is socially or economically sound. Just as an estate duty is a suitable tax for a society with a right of primogeniture, so an inheritance tax is a fine tax for a society where the estate is divided among the children as often happens on the Continent. Supposing, however, that an inheritance tax were to encourage the division of agricultural land between a number of heirs, would this in fact encourage more efficient use of that land than if it were left as one estate? I am not at all qualified to answer that question, but it is generally recognised that small-holdings are not terribly efficient and there are known economies of scale in farming and a considerable need for capital equipment so that division of the land in this way may not be wholly beneficial. On the other hand estate duty has not been a total blessing to agriculture since it is thought that the agricultural relief, which is perhaps necessary to save genuine owner-farmers from an impossible burden of duty, is nevertheless causing inflated values for land as non-farmers attempt to die holding land. Also these absentee land-owners tend not to know much about farming and may not be interested in the question of how efficiently or otherwise land is farmed. These considerations can best be resolved by agricultural specialists but they are questions worth asking.

The other area where dispersion may apply is with the private company. Estate duty certainly encourages dispersion of ownership in any case since a controlling interest invites an asset-based valuation. This dispersion tends however to be painful and takes away some of the freedom of manoeuvre of the man who in many cases founded the business and has made it grow. The inheritance tax may have the merit in this area that the tax can be reduced by dispersion in the will, when in any case the prime mover will be dead, rather than having to divide the shares before death. If on the other hand it is desired to leave the whole of the shares to one son who may be competent to take over the business, then the difference between estate duty and an inheritance tax will depend on the rates of either. The Bolton Committee has suggested that estate duty is hard on the private company. Whether an inheritance tax would be as hard or less hard would depend on several matters. One is whether the tendency to dispersion would be greater under an inheritance tax than under estate duty and if so whether this would tend to impair the efficiency of the firm. It certainly could if the shares fell into the hands of warring factions. Another is the comparative rates of the two taxes and a third is whether the reliefs for industrial plant and hereditaments would continue to be given. This last relief would be hard to justify in equity under an inheritance tax as indeed would be the continuance of the agricultural relief.

These two areas will need close scrutiny before one accepts the new tax but on the face of it none of the arguments are conclusively for or against the change.

Another question closely bound up with the dispersion is the question of rates and revenue from the inheritance tax. It is accepted that if the same scales as are used for estate duty are applied to inheritances under the inheritance tax then less revenue will be collected. This is obvious because the division of an estate between only two people will obtain two lots of exemptions and will also bring each total lower down the percentage scale. Thus if the same revenue is to be collected then either the exemptions could be reduced or the rates will have to be increased. If the rates go up then one finds that one is back with high marginal rates, which tend to exaggerate inequities where they arise and dictate the need for averaging. Also high marginal rates encourage avoidance. But having accepted that death duties are primarily concerned with the achievement of equality of wealth and the reduction of large estates, then it would make sense to have a tax which can actually be reduced by dispersing one's estate. An inheritance tax does this and, as Professor Sandford suggests, it will be a measure of the success of the tax if its revenue completely disappears. We must therefore be aware that if an inheritance tax is successful in producing the social equality we desire, then it will not produce a very high revenue. We shall then have a tax with a relatively high collection cost, for even the Green Paper suggests that more staff will be needed to collect an inheritance tax than estate duty, but we shall recognise that it is a tax introduced largely for social reasons and not as a revenue raiser.

Part II Equity and Social Justice

These two are not the same thing. The considerations about social justice have to some extent been dealt with in the last Part. Social justice is concerned with the wider aspect of the tax, which has its social effects even on persons who may never pay it. The extent to which wider social justice will be served will depend on the extent to which the tax rates are confiscatory and not merely set high enough to urge testators to divide their estates among a few more beneficiaries than they otherwise might.

The consideration of equity concerns equity between persons who are called upon either to pay the tax or bear it. In this connection we can consider many of the problems which arise with estate duty and observe how they will apply with an inheritance tax.

The inheritance tax primarily recommends itself to us on the grounds shown in the first quotation at the head of this paper. At the moment property is graduated according to the means of a person who has no further use for it and on whom the incidence of the tax will not fall. It is argued, and I think justly, that it makes more sense in equity to look at the means of the recipients of the inheritances. It is with their taxable capacity we should concern ourselves. In simple terms if a poor man receives a legacy of say £7,000 should he pay the same tax as a rich man who receives the same legacy? If he does we are not graduating according to capacity to pay. This is not to deny that there are arguments for looking at the capacity of the deceased. It has for instance been argued that estate duty could be looked on as a form of back duty because the deceased has had the benefit of the wealth in his life-time. But provided the wealth has in fact produced income the high rates of income tax and surtax rob this argument of much of its force. Again it might be said that where the bulk of the estate goes to only one or a very few persons then estate duty provides a tolerable test of capacity to pay. If you are receiving a large estate you can afford to suffer a large amount of duty.

But it must be conceded that, in principle, equity would appear to be better served by graduating according to the means of the recipient of an inheritance. The difficulty arises when one tries to define and apply the precise principles of graduation which we consider desirable.

At this point we must consider the proposals in the Green Paper. Broadly we are offered three possibilities in their pure form and thereafter any combination of them.

Briefly the three pure forms are

1. Variant I. Under this form the duty is graduated simply according to the size of the inheritance received from the one testator.
2. Variant II. Here the inheritance is graduated cumulatively with other inheritances received earlier.
3. Consanguinity. Under this there are a series of scales for any inheritance and one chooses the scale by reference to the degree of consanguinity of the heir to the deceased. Naturally the closer the degree of consanguinity the more lenient the scale.

In equity Variant I does not stand up to analysis very well. Suppose that on the same day two legatees of equal means receive their legacies. A receives a legacy of £20,000 and B receives two separate legacies of £10,000. Under any system of graduation, unless the first £20,000 is exempt, A will pay more duty than B. This does not appear much more just than estate duty. It might be argued that most people do not receive legacies of any substance and very few people receive several of any size, so that the chances of the inequity coming to light in such a dramatic way will be slight. There is however the chance that an inheritance tax might make it happen more often since an obvious avoidance device will be for a man and his brother to divide their estates between their son and their nephew rather than each leaving his whole estate to his son.

If we are changing a tax to secure greater equity it would seem that we ought to reject Variant I. Unfortunately there are two features in its favour one of which I shall mention again under my discussion of administration, for it is administratively the simplest, and the other is the fact that it is the system adopted generally by the EEC countries.

Variant II appears to have more to commend it since graduation is not based on the size of one isolated inheritance, but on all the inheritances which a person has received over a period. It is surely true that this is a better test of taxable capacity. But the question then arises; over how long a period should we continue the test? A life-time has been suggested as an optimum period. One argument against this, canvassed by the Green Paper, is that it does not take account of the taxable capacity of the heir since a poor man may in 1980 be called upon to pay a high rate of tax on a modest legacy because it is aggregated with a large legacy which he may have received 50 years earlier and perhaps given to charity. One might reply to this argument that either the poor man is responsible for his lack of funds or that, if he has fallen on hard times, he would nevertheless have been much worse off if he had not received the earlier legacy. It is hard to push this argument with conviction, but it has some merit especially as the tax even at the top rates will fall far short of 100 per cent of the legacy.

Another argument against a life-time test is the fact that it is thought to be administratively impossible. The Green Paper suggests this. The argument is spurious to some extent since the Government is not averse to making us keep life-time records of capital acquisitions for the capital gains tax. These are recorded on the annual income tax return and inheritances could be similarly recorded. The only difficulty then would be to obtain the records of immigrants to the country and this might indeed be impossible. Accordingly we should perhaps tentatively opt for a limited period rather than for a life-span. The trouble here as with any arbitrary barrier is that marginal problems arise and distortions creep in by people making arrangements to keep their 'tax-points' on the non-taxable side of the barrier. Phrases like 'locked-in' may begin to apply to certain assets as they have done with capital gains tax.

Both of these variants will have to be reconsidered under the heading of administration.

The last variant, which is not numbered in the Green Paper but which may be referred to as the consanguinity principle, is one which can be rejected on any logical grounds.

The first of the arguments for consanguinity put forward by the Green Paper is that a legacy received by a person not related to a testator is an unlooked for windfall. That is not very convincing. If testators leave legacies to unrelated persons rather than to their families it is usually because the legatee has rendered some long and devoted service to the testator and perhaps his own family has neglected him. Absolutely unlooked for windfalls must be very rare.

A further consideration is that of liberty and in particular the liberty of testamentary disposition. I have suggested earlier that a test to be applied to a tax on death is the extent to which it interferes with the natural wishes of the testator as to the direction of his bequests. It is almost a nice theological point whether weighting the fiscal scales toward one choice rather than another is a reduction of liberty, but at least estate duty was neutral in this respect and it would appear as well to keep an inheritance tax as neutral as possible.

As a counter to my last argument we might set the natural desire of the testator to provide for his wife and family and the desire of society to encourage family cohesiveness. To satisfy these two desires it might seem a good idea to allow some relief for bequests to close relatives. But is this logical?

There is certainly a sound argument for not disturbing the general standard of living of wives and infant children who have already to bear bereavement. This would be considered unjust at any level of society except perhaps in those few cases where there is obviously wealth surplus to any reasonable standard of living. Surplus wealth clearly does provide a taxable capacity, whether or not the estate is left to the wife and children, and should be fully taxed. But this would best be dealt with by allowing a wife and dependent children, and perhaps infirm parents in some cases, a fairly wide margin of exemption and thereafter the same progressive scales can be applied as for anyone else. By dependent children I would refer to infant children and handicapped adult children. Any other children should not be particularly favoured.

Another feature is that the reduction for consanguinity is presumably intended to encourage a testator to provide for his wife and family in preference to others. In most families the desire of the testator is to do precisely that and no amount of fiscal incentives are required. But in cases where the testator dislikes his wife and family, whether for good or bad reasons, what amounts to a fiscal fine will not prevent him from leaving his estate elsewhere, since the fine will not fall on himself and to save it will only benefit the same wife and family whom he dislikes.

At the moment we have the Inheritance (Family Provision) Act to deal with cases of testators who do not provide for their families and this is a fairly subtle instrument since it can both take account of the circumstances of the wife and family and the reasons for the testator's dislike of them. A similar provision would still be needed under the proposed consanguinity scheme to deal with those testators who capriciously prefer their mistresses to their wives.

Again the consanguinity principle cuts clean across the principle of taxing according to ability to pay. A son may have a much greater taxable capacity than an impoverished niece and yet he would pay less tax on the same legacy. Again why should a niece pay less on the same legacy than the daughter of an old friend of the testator? And lastly this principle gives rise to absurd logic-chopping where trusts are concerned. The Green Paper cites the case of a man who settles property on his sister for life with remainder to her son. It asks: 'Does the son inherit from his uncle or from his mother?' There is no logical right answer to this but there may be several different personal ones. Any rigid set of rules cannot possibly cope with the complexities of human relationships and this is not the province of tax law. We should do better to retain the rules of equity and tax according to capacity to pay. Let us give wives an exemption of say £20,000 and dependent children say £7,500 each (but taking this from the combined estates of both parents) and then tax them on precisely the same scales as anyone else. We must also retain the Inheritance (Family Provision) Act in any case.

A previous researcher in this field, A. A. Tait, concluded that 'overall there appears every reason to question rates varied according to consanguinity and little reason to commend them'. It seems reasonable to agree with him.

The next social problem which needs to be considered is the transitional problem. I suggested at the beginning that certainty was an important criterion for a tax. Although there have been a multitude of breaches of this principle in recent tax legislation it is still a very important criterion and not least where a tax on death is involved. Once a man is dead he can do nothing to alter his dispositions, and he needs to know before his death what the effect of his dispositions will be. Estate duty was largely certain. Apart from the 1969 changes it has been on the statute book for a very long time and much of it has been the subject of judicial interpretation. Its very certainty is a strong factor in the growth of the estate duty mitigation industry, which, while it does reduce the yield from the duty, does nevertheless make people look at their financial affairs and causes them to make proper wills and see that their families are provided for. People making their wills do need to know roughly what tax will be payable and the net amount that their beneficiaries will receive. Because of this any new tax will have to be as near perfect as we can make it when it is introduced so that people can revise their affairs with some certainty. It will also have to be free of tampering and adjustment after its introduction for the same reasons.

With regard to the immediate transition the Green Paper suggests a period of notice of six months to a year during which time, it states, wills can be redrawn and perhaps settlements altered. I do not think that this will do at all and even the authors of the Green Paper clearly have doubts. The people this will affect will be the elderly who will not readily understand the new system, who may be unable to afford the requisite professional advice even if it is obtainable in so short a period, and who in some cases will even be too infirm to do anything about it. Further it is unlikely that settlements can be altered as easily as the Green Paper suggests, since the death tax is not the only tax to be taken into account and some of the beneficiaries may be unborn. To take another instance, an MWPA insurance policy taken out when a man was 30 would probably have been exempt for estate duty. It could quite logically be taxable under an inheritance tax. One cannot alter that sort of arrangement by six months' notice.

It may in fact be necessary to allow elderly persons and others who die say within three years of the introduction of the new tax to have their estates taxed under estate duty unless they themselves or their executors in some cases elect for the inheritance tax to apply. Some 'sweetener' may have to be given to the elderly to persuade them to elect so that estate duty is not still with us in thirty years' time. However if they are allowed to pay estate duty there will certainly be problems with the inheritance tax on heirs if a cumulative tax is applied and also where there are settlements involved. But these problems can be solved and it seems to me to be the social cost of altering a tax which has existed since 1894 and on the basis of which many elderly persons have made their dispositions, settlements and wills.

Lastly under this discussion of equity there is one instance which comes to mind where an inheritance tax could produce less equality or social justice than estate duty. Suppose a testator has three sons, two of whom have amassed considerable fortunes and the third of whom has fallen on hard times. Under estate duty the testator might well give the bulk of his estate to the third son in order to even up the inequalities.

An inheritance tax with progressive scales would discourage this because the Government would take less in tax if he divided the estate equally between all three sons. The only ways in which this could be avoided would be either for the tax to be proportional, which does not satisfy the progressive taxation principle, or if the wealth of the recipient were taken into account which is rightly discarded by the Green Paper on the grounds of administrative difficulty.

We have seen then that an inheritance tax may have far-reaching social consequences and the effect of the tax on agriculture and the private business are worthy of considerable expert study before the new tax is adopted. Other social consequences may follow which are not envisaged and they may be no better than the side effects of estate duty. One of the main arguments for inheritance taxes is that they provide better equity between taxpayers. However equity in practice is an elusive concept and there are instances where an inheritance tax may even be less productive of equity and social justice than estate duty. Lastly there are the very difficult and real social problems of the transition where estate duty may have to be retained side by side with the new tax for some years and care will be needed not to distress the elderly and the sick with an imperfectly formulated tax which they may find difficult to do anything about.

Part III **Administration**

This is a most important feature of any tax, but in this instance there are two aspects which must be borne in mind. The first is administration of the tax which embraces ease of collection and difficulty of avoidance as well as cost compared to revenue raised, and the second is the consequences of the tax on the administration of estates.

First, the administration of the tax: we have noted that estate duty is comparatively easy to collect since the assets have to be collected and valued for the administration of the estate in any case and the information for estate duty is available as a by-product. Also much of the tax is paid before probate can be obtained. The estate duty office which administers the tax is small, about 1,000 persons, and so the collection cost is not too high. For an inheritance tax to be collected efficiently the Green Paper envisages an increase in staff of about 200 for the simplest form of the tax, which would be Variant I. More staff would be required for the other forms.

We have also seen that an inheritance tax might be regarded as most successful if its revenue declines, so it looks as though we might be introducing a higher collection cost with a lower revenue. This could only be justified if the social and economic consequences of the inheritance tax were so much superior to that of estate duty. Personally I cannot see that they will be.

Estate duty is collected by means of an affidavit which sets out the assets and liabilities of the estate and is sworn by the executor. It is often incomplete and corrective affidavits are submitted, so that the control is not perfect. However an inheritance tax would appear to require not only an affidavit of the assets and liabilities at death, but also a complete account of the administration of the estate, which will probably need to be audited so that fictitious administration expenses and unwarranted asset write-offs will be detected. Since value at the date of death will not be required, for the inheritance tax will be levied on the values of the assets when received by the beneficiaries, the affidavit will presumably need to be merely an inventory and the method of producing estate accounts will need to be reconsidered. Perhaps we shall have to revive the old solicitors' method advocated by Rowlands.

The Green Paper suggests that it will be necessary to collect the bulk of the tax before probate as at present. This will be relatively straight-forward under Variant I, since the amount of the inheritance fixes the amount of the tax. Even so the valuations will not have been completed at that time and the amount of a share of residue may not become known until several years later. If a cumulative tax or a consanguinity principle is introduced, any tax paid before probate will have to be based on sheer guesswork. Once an amount has been paid on account then it will be an awkward problem at the end of the administration period to apportion this among the beneficiaries but presumably some rules will be thought out to cope with this.

There will also be some collection difficulties. In particular it will be almost impossible to collect duty on an inheritance received by a foreign beneficiary out of foreign property left by a UK testator. The Green Paper recognizes this and it suggests that such property might be exempt from tax and also legacies left by foreign testators to UK beneficiaries.

The first suggestion would appear to encourage the outflow of capital from the UK hotly followed by prospective beneficiaries, and the latter suggestion is contrary to the principles of equity which we have been considering. The Green Paper regards the best solution to be to tax all property, wherever it is, of a person domiciled in the UK and all property situated in the UK of persons domiciled elsewhere. This does not seem to accord particularly well with equity and if one looks to the property rather than to the beneficiary it makes the idea of any cumulative tax impossible. How is one to discover other legacies received by the Chilean beneficiary of a house in Birmingham? However this pattern is the one adopted by the European countries.

Estate duty has been criticized because it is easy to avoid. It has been called the voluntary tax and the tax on those who love the Revenue more than their relatives. However avoidance is never wholly bad. In the estate duty provisions there are certain methods of avoidance which are not only condoned, but even encouraged. These are investments in timber, agriculture, industrial assets, works of art and insurance policies. Favourable treatment has been given to these presumably to encourage people to invest in them. These loop-holes could be easily closed simply by removing the exemption provisions, but successive Governments have chosen not to for social reasons. It may well be the case that similar exemptions and reliefs will be allowed in an inheritance tax, but in that case the arguments for them should be examined very closely, and if they are allowed to remain one should not complain that the tax is easy to avoid.

Equity might indeed be better served by removing these exemptions and subjecting everyone to the same rigour of taxation. If it is then desired to encourage the holding of socially desirable assets subsidies could be given in some other form. This would make more sense but it would involve a difficult transition period.

Another way to avoid estate duty is to give your assets away more than seven years before death. It could be made less avoidable by extending this period still further. One of the paradoxes of an inheritance tax is that it is more easily avoidable, since the gifts can be made in the will and do not even have to be made before death. If the estate is sufficiently widely dispersed then the tax is quite legally avoided. Since we have stated that this might be regarded as one of the purposes of the tax it should not be interfered with.

Of course gifts made before death would avoid the tax altogether and so the Green Paper suggests that something like the seven years period for gifts would have to remain with an inheritance tax. This however appears quite illogical. If we are introducing a new tax based on the recipient's capacity to pay we should surely take into account all his capital receipts and not merely his inheritances and this suggests the need for a gifts tax, which I propose to discuss in Part IV.

Again estate duty can only be avoided by actions taken by the deceased before death while an inheritance tax may be avoided by events taking place afterwards. For instance property might be left to a person with a low rate of duty with the instructions that it should then pass to a person with a high rate very rapidly. A whole series of anti-avoidance provisions will be required to cope with this and those familiar with the working of such provisions know how obscure they can be to understand and how legitimate events unconnected with tax mitigation can occasionally fall foul of them. Every care would have to be taken that a new tax jungle is not created so that a testator has to be too wary when he is drawing up his will.

Let us turn now to the administration of the estate. If the family of the deceased is not to suffer too much hardship and distress it is important that tax considerations should not unduly hold up the administration. One consequence of the proposed tax is that valuations will not be required at the date of death, but at some later date which may even be at the end of the administration. A date will have to be fixed on which the valuation is to be made and presumably provisions will again be required to ensure that artificial values are not created on that particular date, since it will be easier to arrange artificial values on a known date than on the date of death. This delaying of the date of valuation is likely to have serious effects on the completion of the administration. At present valuation is a serious problem since there tend to be long delays in district valuers' offices, and there are further delays in the offices of solicitors and accountants who always have on hand business more pressing than the administration of estates. This means that estates which are otherwise fully administered are held up before the final division can take place by agreement of estate duty valuations. If the valuations are postponed until a later time in the administration, then the 'valuation delay' will begin to run that much later. This could hold up administration for some considerable time.

Those schemes of inheritance tax assessment which are based on cumulative receipts, on consanguinity or on the wealth of the legatee will take much longer to assess. Information may be required not from one solicitor or accountant but from several. In addition there may arise the elegant problems of interlocking estates where the valuations of one affect the others. All of these problems are likely to be made worse by an inheritance tax rather than better.

This problem of administration is one of the crucial issues of an inheritance tax. Variant I we regarded as particularly liable to give rise to inequity, and yet this variant is easily the most simple on administrative grounds. Variant II is sounder in equity but it will give far more trouble in administration and so will hold up the administration of estates as well as costing more on the Revenue side to collect. We should remind ourselves that the new tax is supposedly being introduced because it is more equitable. How much equity then can we afford to sacrifice to administrative ease? It is easier to adopt Variant I, but then is an inheritance tax much better than estate duty since the only measure of taxable capacity we shall be using will be the size of the inheritance itself and estate duty is not so bad a measure in that respect?

Here again the arguments are by no means wholly in favour of an inheritance tax, and if anything the balance of advantage appears to lie with estate duty. Professor Sandford argues that the legacy and succession duties in the UK, which were based on the inheritance tax principle, were dropped in 1949, leaving estate duty in sole command of the field, purely on the grounds that it was administratively simple to have only one tax. But one wonders whether this was the only reason.

Part IV **Other Taxes**

I remarked earlier that equity sometimes needs to be considered not in the light of one tax only, but taking two or more taxes in combination. An inheritance tax needs to be considered in conjunction with the possibility of a gifts tax and a wealth tax. We must also take a brief look at the position of the Capital Gains Tax. All of these would interact with and complement an inheritance tax. If we have an inheritance tax geared to the size of legacies, and even more so if we have such a tax geared to cumulative receipts over a period, then there appears no logical reason why we should gear it only to amounts received on the death of the donor and perhaps in the seven years before his death.

There is every reason to have a cumulative gifts tax so that the tax rate grows higher the more gifts a person receives from whatever source. This is far more equitable than taxing at a high rate those whose relatives happened to die with all their assets and allowing to escape tax those whose relatives passed the assets on. A tax according to the accident of death is almost as bad as inheritance according to the accident of birth. Thus there is a strong logical case for a gifts tax. It would also make sense to carry it still further and have a tax on all capital receipts such as Pools and betting winnings and any other windfalls of that nature. In this respect we might take the capital gains tax off gifts, since the measure of the tax on gifts is fairly arbitrary and gifts do not in any case produce capital gains but capital losses. We could then tax the whole gift by reference to the capacity of the recipient.

If we had a gifts tax its relationship with an inheritance tax would need careful consideration. For instance we could use it to encourage dispersion of estates before death by giving it a lower rate of tax than an inheritance tax, or we could use it as an anti-avoidance device to prevent that method of avoiding the inheritance tax which involves passing property from persons with a low rate to persons with a high rate soon after the death. If such a transfer were liable to a gifts tax it would be discouraged. But then the tax on the gift would have to be almost the same as the tax which would have been paid on death had the property gone direct in the first place. This sort of tax will certainly require consideration if we do have an inheritance tax and to tax gifts in the seven years to death only is not at all logical.

A wealth tax might also be required on the supposition that the inheritance tax has the desired social effect and produces a declining revenue. There would then need to be another means of taxing capital as a measure of social justice, for if capital is used inefficiently then income taxes will not tax its full capacity and nor will they encourage its efficient use whereas a capital tax would. If this were introduced then the capital gains tax which is a very half-hearted way of taxing wealth could be abolished since any capital gains would be reflected in the wealth. There are well-known problems in introducing a wealth tax, not the least being valuation, but an inheritance tax might make a wealth tax desirable if the former's revenue declines.

This discussion on other taxes could be extended indefinitely, but would lengthen this paper beyond the bounds of tolerance. In summary I suggest that a gifts tax would become almost essential with an inheritance tax, but it could also be introduced with an estate duty and this possibility has been suggested by others, and while not wishing to overburden a tax system already heavy laden with 'reform' it might be that a wealth tax will eventually become necessary as the main weapon for achieving social equality.

Part V **Trusts and Settlements**

Lastly there is the problem of trusts. This has been left to the end since it is a crucial problem with an inheritance tax. The problem of trusts was never satisfactorily solved under estate duty. As it is, the death of a wealthy life-tenant may cause serious depredations into the capital of a less wealthy remainderman and very wayward things can happen in discretionary trusts as a result of the 1969 legislation. With an inheritance tax the problem appears more difficult. It is not entirely clear who inherits what in even the simplest case where a testator in his will settles property on persons in succession. It is even worse on the occasion of his setting up an accumulating settlement or a discretionary trust. What too is the inheritance position when a life tenant or a discretionary object dies?

In these cases arbitrary solutions are proposed. For example the Green Paper suggests either that a completely arbitrary charge may need to be made on setting up a discretionary trust or a charge which is geared to the rate of perhaps the beneficiary with the highest rate. These are both very arbitrary indeed. Professor Sandford quotes with approval the solution of Professor Harry J. Rudick (*California Law Review*, vol. 38, 1950, pp. 169–75). Professor Rudick suggests that where a trust of say £100,000 is set up by A with a life interest to B then firstly inheritance tax at B's rates should be calculated on the capital at A's death. If this were £50,000, or one half of the capital then no duty will be payable immediately on A's death but B will only receive, and be liable to income tax on, half the income, while the other half will go wholly to the Government as inheritance tax. The argument for what at first sight seems a strange procedure is that had the tax been paid on the capital at A's death B would only receive half the income in any case. The remainderman also pays inheritance tax on what he receives. This can be extended to discretionary trusts by observing each beneficiary's share of income annually, applying inheritance tax rates to the slice of capital which produced it, and then calling on the beneficiary for the appropriate fraction of the income. My objection to this method is that since it may involve a very high marginal rate of tax on income and only affects the capital after perhaps a long perpetuity period, then the capital may deliberately be inefficiently invested in order to spite the Government while there is a further loss of revenue for income tax. The marginal rate would also tend to be higher on the bigger settlements so that this could affect considerable sums of capital.

The Green Paper is correct in stating that there are no easy solutions to these problems. However in any system of tax reform trusts should be examined closely. Professor Wheatcroft wrote in 1965 that 'in Great Britain it is probably true to say that 95 per cent of all discretionary and accumulation trusts are created solely for tax saving reasons'. (*Estate and Gift Taxation; a comparative study*, Sweet & Maxwell, London, 1965, p. 36.) If this is true then a tax raid on trusts is perhaps in order. It was begun in 1965 with the fifteen year capital gains tax assessments on notional realisations and it was done again in 1969 with the estate duty legislation affecting discretionary and accumulating settlements. However in 1971 the capital gains tax disincentives were removed and with the disaggregation of children's income commencing in 1972/73 trusts will be again well to the fore as a means of tax avoidance. There appears to be a strong case both in efficiency and in equity for a disincentive to the creation of trusts. They are a method only available to the wealthier, and much unproductive time must be spent on their creation and management. In many cases the income barely pays the fees of the accountants and solicitors involved in the running of the trust. It is probable that the combined effects of the Trustee Investments Act and the tax-planning aims of keeping income low mean that the funds are not as efficiently used as they might be and, of course, trusts make difficult the proper attribution of wealth and income for tax purposes. In addition many of the beneficiaries would be better off without the trusts since it would give them greater freedom of manoeuvre and if they were subject to the full rigours of taxation they might have to find ways of using the capital as productively as possible. If an attempt were made to curb the formation of trusts, except in those few cases where the nature of the beneficiaries rather than the tax consequences make a trust necessary, then an inheritance tax could be introduced on more equitable lines.

Thought might again be given to a settlement tax which could perhaps be rebated in suitable instances where the settlement is required on other than fiscal grounds.

This problem again is obviously too wide and detailed to be debated in full here, but it does appear that in any reform of death duties the position of trusts will need to be considered more carefully and more radically than it has been dealt with in the Green Paper.

Conclusions and Recommendations

My conclusions are inconclusive. I began to write with a fairly strong bias in favour of an inheritance tax combined with a gifts tax. However in the course of thinking about the problem I find myself much less enthusiastic. The logic of taxing according to the capacity of the heir rather than of the testator is compelling, but the application of the principle is by no means simple and where a scheme might most closely approximate to equity it becomes completely impractical on administrative grounds. The proposed tax is likely to prolong the administration of estates which in many cases is already prolonged beyond the patience of the beneficiaries. This will be particularly brought about by making the necessary valuations at the end of the administration period rather than at the beginning. On the other hand the problem may to some extent be mitigated by the fact that more of the assets may have been realised at the end of the administration than at the beginning. With regard to social effects we know that estate duty has some embarrassing side-effects, though with none of them is there sufficient evidence to pin the blame exclusively on the duty: we do not know fully what the social effects of an inheritance tax may be. There may be a greater tendency towards dispersion of assets on death, but we cannot be sure whether this tendency will or will not be wholly beneficial. Lastly the change-over will be more difficult than the Green Paper envisages and we shall need to be careful not to distress the sick and the elderly. Whatever new tax is introduced it will need to be most carefully planned and implemented. When it has begun it must not be tampered with for some years so that people can plan their bequests and arrange their financial affairs with the expectation of some degree of stability.

Let us decide therefore whether this tax has sufficient merits to make it worth the change-over from estate duty and if we do let us assist in the setting it up by pointing out the dangers and pitfalls well before they are enshrined in legislation.

I think that the Institute of Chartered Accountants could assist in this by taking the following measures:

1. Ask members for their views on the social and economic consequences of the proposed tax.
2. Set up a working party with the Law Society and perhaps the Bar Association to consider the effect of the tax on probate matters, tax collection, trust law and executorship accounts.
3. Make a detailed consideration of the Green Paper and decide which combination of options appears to make the most sense and then make the strongest representations to the Government on that basis.
4. Make representations concerning any other tax reforms which appear logically to be required in conjunction with the desired form of inheritance tax.
5. As usual watch most carefully any proposed legislation to see that equity is preserved between taxpayers and that their present financial arrangements are not unduly upset.

In conclusion let us welcome the Government's initiative in putting out this Green Paper for discussion and let us consider the proposals most carefully. We should only accept the proposals however if well-founded benefits are seen to accrue other than the following of an equitable principle which may in its implementation prove spurious or evasive.

An Accountant Looks at Social Accounting

Kenneth S. Most

The development of an accounting system which attempts to embrace the operations of a society as a whole depends upon two factors:

1. The extent to which the society purposely sets out to plan its economic future.
2. The extent to which the planners can agree on a fairly detailed image of the realities of the planned society.

The usefulness of such an accounting system will depend upon the extent to which the planners' image conforms with the reality which it purports to represent.

Social accounting is such an accounting system. Yu would prefer to call it macro-accounting, since he sees important similarities between this and other forms of accounting which suggest to him that the distinction between social and private accounting lies primarily in the size of the economic unit studied.[1] 'We use the term social accounting . . . to mean the whole system of accounts and balance sheets of a nation or region, their price and quantity components and the various consolidations that can be derived from them.'[2] Although the term can be criticised it appears to have acquired wide currency, and we shall follow this current usage.

In this paper we shall first examine the history of social accounting in the context of national planning, and the Soviet Russian and US systems which represent the two principal branches found in practice; this will permit us to identify the image of economic reality which underlies them and to show how they may be modified to conform with a more complex picture of a modern industrial society.

History of Social Accounting

Early work in the measurement of national income and wealth was predominantly statistical.[3] First attempts at 'national income accounting', or providing estimates of national economic aggregates through the medium of an accounting model, were made in the 1920s in Soviet Russia; a similar path was followed by the UK, the USA and Canada after the Second World War, aided by a 1944 conference on procedures which clarified the terminology and methods to be used.[4] Many other countries have introduced social accounting since those pioneering efforts established the feasibility of these methods.

Planning is a complex of actions which involves determining the goal to be attained, identifying the necessary means and choosing among those means the ones which appear to permit attaining the goal at the lowest subjective evaluation of sacrifice. The plan itself must arrange the employment of those means selected through time and space in such a way that their complementarity is fully exploited. Soviet planners first attempted to formalise their plans purely in terms of physical quantities, but the great failures of their early efforts directed attention to the need for a financial plan, or national economic budget. Only by translating the various operations contemplated by the plan into monetary terms, and expressing the result in the form of accounts, could the hierarchies of preferences and scarcities and the possibilities of substitution between goods and manufacturing processes be brought together in order to evaluate them and produce an economic plan.[5] In Marczewski's view, the fact that important economic decisions were made without such national accounts does not vitiate this observation, since they consisted of choices between a limited number of variables and variations, the full effects of which were impossible to measure and compare.

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[1] S. C. Yu, 'An Appraisal of Macroaccounting', in *Aspects of Contemporary Accounting* (Florida, 1966), p. 25.

[2] M. Gilbert and Richard Stone, 'Recent Developments in National Income and Social Accounting', *Accounting Research*, Vol. 5 (1954), p. 2.

[3] Paul Studenski, *The Income of Nations* (New York, 1958), Chs. 2–10.

[4] Edward F. Denison, 'Report on Tripartite Discussions of National Income Measurement', *Studies in Income and Wealth*, Vol. 10, Conference on Research in Income and Wealth (New York: National Bureau of Economic Research, 1947).

[5] J. Marczewski, *Planification et Croissance Economique des Democraties Populaires*, Vol. 1 (Paris: Presses Universitaires de France, 1956), p. 155.

Like the Soviet social accounts, the UK system was first developed for planning purposes. The watershed can be found in the period 1940–42; in 1940, Hicks published an important paper distinguishing between the concepts of national income at market prices and at factor costs, but which was clearly statistical in outlook,[6] and in 1942 he published the equally influential textbook *The Social Framework*[7] which he had to be dissuaded from calling 'The Social Accounts'.[8] In the intervening two-year period, a collection of national income *statistics* such as the ones provided by Colin Clark[9] were transformed into a putative accounting *system*; Harrod, in his biography of Keynes, indicated exactly how this took place.[10] Keynes' book, *How to pay for the War*, created some interest in the possibilities of planning the national economy more effectively and led indirectly to the appointment of two economist-statisticians, James Meade and Richard Stone, to the staff of the UK Treasury, where Keynes was already installed in a semi-official capacity. These economists produced a statement in account form which analysed the UK national income and expenditure in the winter of 1940–41, and the following passage from the Harrod biography is particularly interesting in the light of current debates on valuation in accounting:

> The Treasury had hitherto confined itself to figures for actual, known transactions. This account included estimates, and certain figures had to be obtained by the method of difference from other estimates – all of which was very dangerous. Yet this kind of national income accounting has come to be regarded as the essential tool of any economic planning, whether of an individualist or socialist variety.[11]

There appear to have been two principal causes leading to the adoption by non-Communist nations of an accounting framework for their national income statistics. The first of these was a series of persuasive books and papers, starting with Fisher's *The Nature of Capital and Income*, asserting the relevance of accounting methodology to the measurement of national income; these works created an intellectual climate favourable to the task. The second and proximate cause was the wartime condition under which Meade and Stone worked; the government had requisitioned a large part of the UK economy, and the government budget, in the form of an income and expenditure account, became a major part of the total picture which national income statisticians were attempting to portray. The construction of a similar two-sided income and expenditure account for the entire national economy was thus facilitated.[12] The initiative was followed almost immediately by economists in the USA, where the annual publication of social accounts was started in 1947, the same year as the UK.[13]

Although the transition from statistics to accounting can be demonstrated fairly clearly, the subsequent development of systems of social accounts in the non-Communist world cannot be attributed to national economic planning. True, the stated objects of national income statisticians include the formulation of economic *policy*, but few of the countries concerned possess the legal and institutional framework which would permit policies to be translated into plans, and those which do, such as France, aim principally at the planning of money flows rather than the production of goods and services: the state influences the choices of its subjects by increasing and decreasing their command over the means of payment, and not by directives allocating land, labour and capital to specific output objectives.

It has been suggested that the testing and development of economic theory is an important objective of national income statisticians, who are interested in the production of quantitative data to be fitted into macroeconomic models, in particular.[14] This motive is clearly apparent in the Hicks paper cited,[15] where the money valuation of the national income is considered. The particular money values to be used, says Hicks, depend upon the purpose for which the calculation of national income is to be used; if social income is to serve as an index of welfare then it should be valued at market prices 'because prices give us some indication of marginal utilities', but if social income is to serve as an index of production, then it should be valued at factor costs. This distinction is only tenable on the assumption, firmly made by public finance theorists at that time, but less acceptable today, that indirect taxes are passed on to consumers in the form of prices (and that corporation and other direct taxes are not).

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[6] J. R. Hicks, 'The Valuation of the Social Income', London, *Economica*, Vol. VII, No. 26 (1940), pp. 105–24.

[7] First English edition, Oxford (1942).

[8] Personal communication from the author.

[9] C. G. Clark, *National Income and Outlay* (London: Macmillan and Company, 1937).

[10] R. F. Harrod, *Life of John Maynard Keynes* (New York: Harcourt, Brace, 1951), pp. 497–503.

[11] Ibid., p. 498.

[12] Studenski, p. 153.

[13] See Gerhard Colm, 'Experiences in the use of Social Accounting in Public Policy in the United States', *Income and Wealth*, Series I, International Association for Research in Income and Wealth (Cambridge, 1951).

[14] M. Yanovsky, *Social Accounting Systems* (Chicago: Aldine Publishing Co., 1965), pp. 12, 216; and Jean Meyer, *Comptabilite d'Entreprise et Comptabilite Nationale* (Paris: Dunod, 1969), p. 11.

[15] 'The Valuation of the Social Income.'

It can be seen from the Hicks paper that he had in mind the empirical testing of propositions in welfare theory as a reason for obtaining a figure for social income at market prices, thus extending the scope of Pigou's contribution to this field.[16] The empirical testing of propositions in macro-economic theory, by providing quantitative data on aggregate demand, the consumption function, the multiplier and the marginal propensity to invest, and by demonstrating the *ex post* equality of saving and investment, would also stimulate efforts to calculate national income at market prices. National income at factor costs would provide data for the development of a social production function and for verifying theories of the effects of changes in labour productivity on wage rates. As evidence for the proposition that Richard Stone was also thinking on these lines, we may note that he has said:

> In attempting to give quantitative expression to empirical constructs, such as the national income, it is now generally recognised that a theoretical basis is necessary and that this basis should be the conscious concern of economists and not left in its practical aspects exclusively to business men, accountants and the Commissioners of Inland Revenue. Equally it is clear that economic theory cannot be left at the theoretical stage but requires to be tested and given quantitative expression by being brought into relation with observations. These lines of attack have resulted in very considerable efforts to bring into being both observations which are relevant to economic theories, and also economic theories, or formulations of theories, which are capable of being brought into relation with observations.[17]

The history of social accounting since the Second World War, and particularly its development in the USA and the UK, tends to support this hypothesis, albeit tenuously. A great deal of work has been done to improve the quality of the individual statistics collected, but the accounting framework remains inchoate, as it was left by Stone and the other pioneers.[18] The disappearance of the business sector from the US national income accounts, which has been criticised by Yu and Rosen, among others,[19] is explicable by reference to an economic theory which abstracts from institutional factors: there are no theoretical constructs which call for quantification here. The main thrust of government has been on the 'Flow-of-funds' accounts, presumably because the Federal Reserve System has accepted some responsibility for planning and controlling money flows. The inter-related social accounting systems of France, Holland and Norway, countries which have established forms of national economic planning, provide a sharp contrast to the US and UK systems, which contain a vast amount of statistical material but are composed of sets of accounts leading 'separate lives'.

The Soviet System

In the Soviet system of social accounting, a techno-economic production plan constitutes a budget in real terms, on the basis of which the accounts themselves are constructed. The main purpose of these accounts appears to be aimed at adjusting money flows to correspond with the real flows envisaged in the plan. There are three kinds of account:

1. National product.
2. National income.
3. Flow of funds.

The national product is defined in Marxist terms as: C_a+V+M, where C_a is the constant capital (equipment and production materials), V the variable capital (subsistence requirements of labour) and M the surplus-value, produced by the variable capital. National income is defined as $V+M$. The national product account is divided into investment (A) and consumption (B) as a preliminary to controlling the distribution of income in money terms.[20]

In the Soviet system, as in any other, there is no question of an equality between 'surplus-value' and 'investment'; firms are not allowed to retain the whole of their profits, or forced to rely on profits for their investments. The greater part of profits is paid over to the state; firms receive subsidies for the acquisition of equipment. The picture must, therefore, be completed with the aid of a flow-of-funds account, which in this context is primarily a cash account for the whole economy. This cash account is a consolidated statement of the transactions of the various organs of the State, state enterprises, banks and other institutions, together with estimates for the public.

Whereas the product account appears to be an attempt to portray the process whereby real goods and services are produced and the capital used up in the process is replaced, the receipts and payments account shows the transactional relations between the sectors of the economy. It is, therefore, more of a cash account than a funds statement.

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[16] A. C. Pigou, *The Economics of Welfare* (London: Macmillan and Company, 1920).

[17] Richard Stone, *The Role of Measurement in Economics* (Cambridge, England, 1951), p. 3.

[18] See, for example, 'The National Income and Product Accounts of the US: Revised Estimates, 1929–64', *Survey of Current Business* (August, 1965), p. 6.

[19] Sam Rosen, *National Income* (New York: Holt, Rinehart and Winston, 1963).

[20] Marczewski, p. 492.

FIGURE I
Soviet Social Accounts[21]

Public Co-operatives Small traders Capitalistic firms	Manufacturing Construction Agriculture Transportation of goods Production communications Production commercial services Other tangible production Restaurants Production services of banks	A. *Investment goods:* 1. Fixed capital 2. Working capital	1. Equipment industries 2. Consumption good industries	*Intermediate consumption:* 1. Depreciation (capital) consumption 2. Reduction of working capital, e.g. raw materials inventory
		B. *Consumption goods:* these are allocated to →	Households Collectives Inventory changes Government reserves and then to →	*National income** 1. Fixed capital formation 2. Working capital formation 3. Increase in stocks of consumption goods 4. Consumption *V+M.

The national income account shows how the national product is distributed, in the form V+M.

The Soviet National Income Account[22]

Real	Monetary
I. Consumption goods 1. Households 2. Collectives a. Civil b. Military II. Investment goods 1. Productive fixed capital 2. Non-productive fixed capital 3. Working capital	I. Wages and social security (V) 1. Wages – tangible production 2. Social security charges 3. Income of agricultural and craftsmen's co-operatives II. Surplus-value (M) 1. Profits a. State enterprises b. Agricultural and craftsmen's co-operatives c. Small traders d. Capitalistic firms 2. Turnover taxes

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[21] Adapted from J. Marczewski, 'The role of national income accounts in the planned economies of the Soviet system', *Income and Wealth*, Series IV, Phyllis Deane (ed.) (London: Bowes & Bowes, 1955).

[22] Ibid.

FIGURE 2
Receipts and Payments of the Soviet Union[23]

Receipts	Payments
A. *Receipts from enterprises, state agencies and co-operatives*	A. *Payments to enterprises, state agencies and co-operatives*
1. Public sector wages and co-operative members' income	1. Purchases of goods from state enterprises and co-operatives
2. Receipts of communal units other than from sales	2. Payments for services:
3. Sales of agricultural produce to state and co-operatives	a. Rent b. Transportation
4. Pensions	c. Other current services
5. Study bourses	d. Cinema, theatre and other shows
6. Interest, insurance, construction loans	e. Sanatoria, holiday homes, etc.
7. Other	f. Other services
Total Section A	3. Taxes, insurance, subscriptions
	4. Saving
	Total Section A
B. *Receipts from the sale of goods and services to the population*	B. *Payments for purchases of goods and services by the population*
1. Receipts from communal sales	1. Purchases on the communal market
2. Receipts from craftsmen's sales	2. Other purchases
Total Section B	*Total Section B*
Total A+B	*Total A+B*
(=reduction in money supply)	(=increase in money supply)

The US System

We shall regard the US system of social accounts as representative of the non-Communist world; it is not as well articulated as some systems, but provides more statistical detail than most.[24] The division of the economy into production and consumption conflicts with the transactional basis of primary sectorisation, and is conceptually narrower than the Soviet division into investment and consumption; this may arise out of the reliance of Western economists on marginal techniques of analysis. The assumption that physical quantities of goods and services are the basic measures, separable from the prices by which they must be multiplied to arrive at values, is a first indication that we shall find the same Ricardian model of the economy underlying both the Soviet and the US systems. Hicks is explicit on this point: there are two problems involved in the determination of the national income, the enumeration of real goods and services and their evaluation in money.[25] There is also an index number problem, which has been studied at length by welfare economists.[26]

Unlike the Soviet system, the US accounts fail completely to come to grips with the physical quantities, and start with monetary data concerning payments, which are adjusted for accruals to make them correspond with acquisitions and disposals. Consolidation of transactions originating in the business sector, however, obliges the accountant to accommodate data concerning uses, the most important item being depreciation. The imputations of interest in the business sector accounts and of rental income in the personal sector accounts further aggravate the duality of the construction of these accounts, which can be seen on a comparison with the Soviet receipts and payments account to deal essentially with acquisitions rather than uses. This attempt to include non-market phenomena obscures the money flows of the nation, so that a quite separate Flow-of-funds (or 'money flows') account is produced by the Federal Reserve System. Identification of this 'flow' in the real world discloses the existence of capital movements in addition to those differences included in the essentially 'current' income and product account; the net result of the Flow-of-funds account is to equate saving and investment and to demonstrate the institutional structure of each of these classifications. The Flow-of-funds statement is, therefore, comparable not with the receipts and payments account of the Soviet system but with the funds statement of the business enterprise. In the last analysis, the US national accounts, like the business accounts which they attempt to imitate, do not include a statement of cash flow; this is submerged in the detailed statistics of the Federal Reserve System, and only the net increase or decrease of the money supply is incorporated in the Flow-of-funds statement.

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[23] Ibid.

[24] Yanovsky, op. cit., Ch. II; and *The National Economic Accounts of the USA: Review, Appraisal and Recommendations*, National Bureau of Economic Research, General Series 64 (1958), p. 28.

[25] Hicks, 'The Valuation of the Social Income', p. 105.

[26] I. M. D. Little, *A Critique of Welfare Economics*, (2nd ed.; Oxford, 1957), Ch. XII; and J. de V. Graaff, *Theoretical Welfare Economics* (Cambridge, Massachusetts, 1957), Ch. XI.

US National Income and Product Account

Income	*Product*
Factor payments	
Wages and salaries	Sales to consumers
Rental income of persons	Sales to government
Interest received	Sales to abroad
Corporate and other profits (including retentions)	Sales to investors Net change in inventories
Corporate profits taxes	
Social security payments	
Transfer payments	
Depreciation (not a payment)	
Indirect business taxes	
Business and government transfers	

US National Flow-of-Funds Account

Current expenditures	Current receipts
Goods and services	Income receipts
Transfer payments	Transfer receipts
Capital expenditures	
Financial investment	Increase in liabilities

NB. There is usually a balancing figure, due to a statistical discrepancy.

The input-output tables which make up the third principal component of the US system of social accounts are something of an oddity; they attempt to perform, in money terms, the function which the Soviet national product account performs in real terms. The assumption of an identity between money flows and real flows is supported by additional assumptions of *constant* input coefficients (as compared with the Soviet practice of using calculated norms as techno-economic coefficients), a *constant* allocation of inputs to outputs in multiproduct firms, and *constant* prices.[27] The result is a set of tables which purports to quantify the 'flow' of resources interindustry, between the public and private sectors, and between the US and the rest of the world, but which in fact represents a primitive attempt to analyse complex economic phenomena using an inadequate conceptual framework. In this it resembles the cost departmentalisation tables used in industry, particularly in the late nineteenth century, which led indirectly to irrational price competition and ultimately to price-fixing agreements, trusts and cartels. It seems unfortunate that the knowledge accumulated by cost accountants and industrial engineers during the past 70 years could not have been tapped before Leontief started his enormous undertaking.[28]

Turning to the measurement of wealth: although the earliest national statistical exercises were aimed at the measurement of wealth, recent emphasis has been on Fisherian 'income flows'. For this reason the US does not count a national balance sheet among its social accounts, although unofficial attempts to construct one have been made.[29]

The structure of a national system of social accounts of the non-Communist type is shown in Figure 3, which also reveals the extent to which the US is in a position to implement it in its entirety. The dotted lines signify the elements and connections which are as yet incomplete, and the diagram should be read in conjunction with the criticisms of the US social accounting system which this paper contains. The diagram shows only the capital and revenue 'flows' and the cash 'flow' would necessitate a separate set of accounts linked to the right-hand boxes through cash transactions. Flow accounts for other forms of resources, including credit, would likewise call for separate sets of accounts, linked to particular values as they appear in balance sheets.

Social Accounting Critically Appraised

Both systems of social accounting are incomplete, although their technical deficiencies could conceivably be rectified as economic statisticians learn more about accounting, or as accountants occupy themselves with social accounting. What is more to the point, however, is that both systems are conceptually defective, since they proceed from certain beliefs about economic realities which are scarcely tenable in a twentieth century environment. The Soviet social accounts are founded on Marxist economic theory,[30] and a misreading of it, at that.[31] This not only leads to the adoption of a 'narrow'

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[27] See Hollis B. Chenery and Paul G. Clark, *Interindustry Analysis* (New York: John Wiley and Sons, Inc., 1959), pp. 157–78.

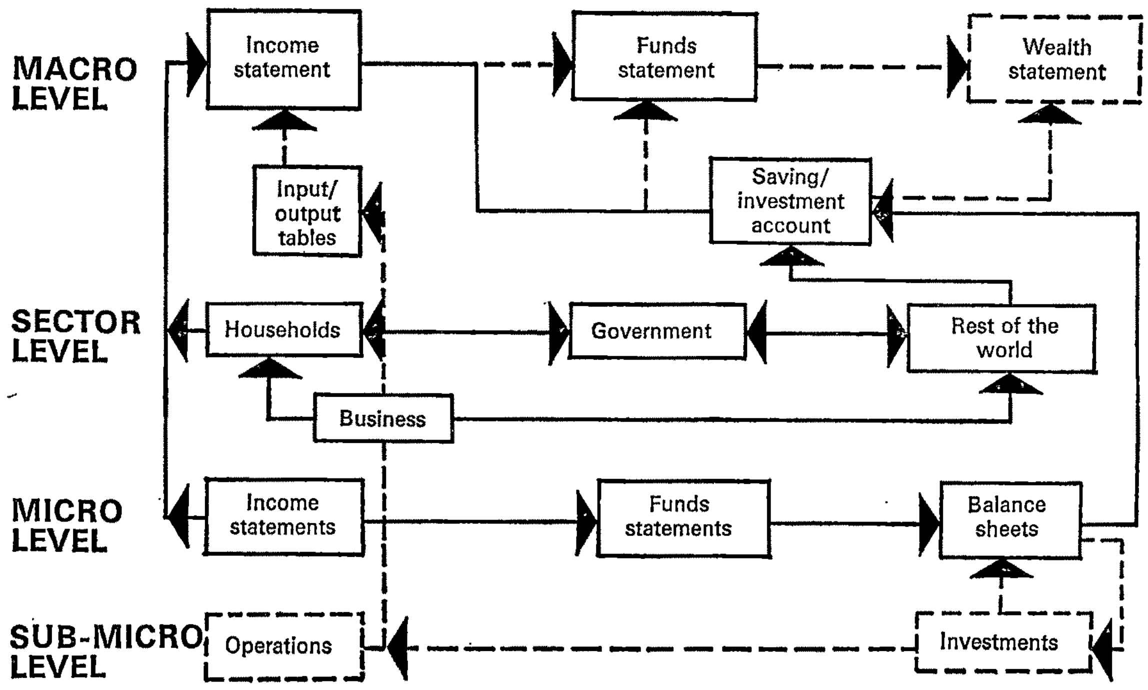
[28] Wassily Leontief, *The Structure of the American Economy, 1919–29* (rev. ed.; New York: Oxford University Press, 1951).

[29] Raymond Goldsmith, *A Study of Saving in the US* (Princeton, 1956), Vol. 3, Part 1.

[30] Studenski, p. 352.

[31] Ibid., pp. 22–3; and Michael Kaser, 'A Survey of the National Accounts of Eastern Europe', in *Income and Wealth*, Series IX, ed. Phyllis Deane (London: Bowes and Bowes, 1961), pp. 143–4.

FIGURE III. A NATIONAL SYSTEM OF SOCIAL ACCOUNTS



concept of income which excludes many services; it also precludes a rational approach to investment because of the inability to value the services of capital which is inherent in Marxism. A further feature of the Soviet economy which undermines the effectiveness of the social accounts is the characteristic directive system, with planning effected primarily in physical quantities and prices imposed from the planning level rather than agreed at the level of consumption, or investment. The basic materials of Soviet social accounting are money and physical resources, the *balances de ressources en nature* as Marczewski calls them, lists of which are submitted to the political organs of the state for consumption and investment decisions. The confrontation between ideology and reality takes place at the highest political level, and the task of the planning branch of government is to translate the wishes of the political organ into a form capable of fulfilment. The prices which are used in the social accounts enter into the planning process at a comparatively late stage; they are 'valuations', it is true, but of a kind which differs fundamentally from the agreed values of a free society originating in the subjective considerations of a multitude of individuals. There is no way of determining whether the contents of the Soviet national product or income accounts are 'true' or 'false'; only cash receipts and payments are capable of objective verification.

If the society which the Soviet leaders are engaged in planning were in fact susceptible to direction of this kind, that is, if the people were willing to accept the valuations made by the planning officials, then this method of constructing social accounts would not be open to criticism. The values would provide stimuli of a quasi-physical nature, and the 'body' politic would react accordingly. But the Soviet people are not essentially different from other people, and each individual is capable of developing his own values; since there is no official institutional framework within which these values can be asserted, he must necessarily create an unofficial one. The unofficial institutions which arise exert their pressures against the organs of the state, and the resulting compromise falls far from the planned parameters of the national budget. The usefulness of the Soviet social accounts appears to lie more in the initiation of a debate than in the resolution of a conflict arising out of the fact that means are scarce relative to ends.

The US system also fails to come to grips with this problem since the relevant aspects of valuation are purposely avoided.

Instead of seeking to build up a single total, such as the national income, an investigation is first made of the classification of accounting entities, of the types of accounts that they keep and of the transactions into which they enter. In this way, all the transacting entities of an economic system are classified into broad sectors such as productive enterprises, financial intermediaries and final consumers, and a series of accounts for each of these sectors is set up, in which the separate entries represent economically distinct categories of transaction. Economic activity is represented by money flows and related book-keeping transactions, actual or imputed, between accounts. The national income and other similar aggregates are obtained from the system by selecting and combining the constituent entries in the accounts.[32]

It is not essential that a system of social accounts should provide, at one and the same time, an accounting analysis of the economy such as would aid the planning process and also the economic aggregates required by politicians and economic theorists, any more than the measurement of income is a necessary feature of a business accounting system. The French *Comptes de la Nation* differ from the US and most other non-Communist social accounts in that they constitute a disaggregated set of interrelated accounts; they do not show 'gross national product' or 'national income' and there is no financial statement as such which is designed to reveal the national income or product, or capital formation. Indeed, the definitions of flows used by French macro-economists differ from those of US and UK macro-economists, and the aggregate 'gross domestic product', for example, is obtainable from the *Comptes de la Nation* where the aggregate 'gross national product' is not.

The fundamental problem, as the welfare economists have pointed out, is 'Who shall value the national income?' Income is a personal concept relating to consumption, whether present or anticipated future; it quantifies being 'better off', in Hicks' phrase, and must relate to an identifiable individual who can be said to have changed his state in this way. Profit, or business net income, is the result of a substitution of revenues for costs, and must be related to a stage in a process of production, whether called an 'entity' or a 'profit centre'. Measurement, defined as expressing the degree of difference in distinguishable characteristics and bringing it into a certain relationship with a set of numbers (in this context, a monetary scale), is an observable social phenomenon in both cases. The *social* income can only be regarded as a measurable fact if we first 'set up a theory from which income is derived as a concept by postulation and then . . . associate this concept with a certain set of primary facts'.[33] The social accounts are believed to find their theoretical foundation in Keynes' *General Theory*, but closer inspection will reveal that the model used is essentially the Walrasian systematisation of a closed economy, which was adapted by Hicks and Hansen to cope with some of Keynes' more manageable criticisms of that system's lack of contemporary realism.[34] On the other hand, the principal feature of current work in the field of welfare economics is the meticulous demonstration of the inapplicability of neo-classical price theory to the development of propositions concerning human welfare; the virtual impossibility of bringing such propositions beyond a point of banal generality is the main product of these publications.[35]

The transition from individual, or small group, personal income to national, or social, income can be made in at least two ways. An individual dictator or an oligarchy can impose his or their values upon a society, so that the national income can be found from his or their subjective preferences; we have indicated in our remarks on the Soviet system that a modern economy is too complex for this. Alternatively, we can appoint specialists to carry out this task on behalf of the population as a whole, as we delegate so many of the important tasks of our society to committees of experts. These men would have to be experts in valuation, however, not in statistics; they would need to be chosen from the ranks of those whose rationality was buttressed by a knowledge of men and affairs. In the last analysis, the measurement of the national income turns out to be a political action, as the measurement of business income turns out to be a business judgement; on no account can it be a purely statistical exercise based upon the summation and consolidation of money flows.

To this the national income accountant may reply that his aggregates, while derived from money flows, are surrogates for the 'real' income and product which we would prefer to know, but fail to grasp. The use of the word 'real' here is the source of much difficulty, because of a duality of interpretation of the manner in which it is contrasted with 'monetary'. The adjustment of money values by means of a price index so as to express them in terms of a common base can never improve the usefulness of national income statistics beyond making them more comparable; it is a pure smoothing exercise, and any deficiencies of the initial observations are transferred intact to the adjusted figures. This version of 'real' national income, i.e. current national income adjusted by means of a price level index, is different from the concept of 'real' national income as the goods and services which, measured in physical quantities, are to be multiplied by prices in arriving at an index of welfare, or production. It is this latter concept for which money national income is to serve as a surrogate.

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[32] *Measurement of National Income and the Construction of Social Accounts*, Report of the Sub-committee on National Income Statistics of the League of Nations Committee of Statistical Experts, United Nations (1947), p. 7.

[33] Richard Stone, *Measurement in Economics*, p. 9.

[34] The *General Theory* is sufficiently obscure in places to be quoted, like the Scriptures, for a variety of purposes. We claim its support for our attempt to bring investment into the centre of accounting theory, as Keynes attempted to direct attention to the importance of investment in economic theory. The particular point at issue appears from a study of J. R. Hicks, 'Mr Keynes and the Classics', *Econometrica*, New Series, Vol. 5 (April, 1937), pp. 147–59; and Alvin Hansen, *A Guide to Keynes* (New York: McGraw-Hill, 1953), pp. 3–35.

[35] Little; Graaff; William J. Baumol, *Welfare Economics and the Theory of the State* (London, 1952).

If monetary measurements of national income are to be used in this way, then the implications of our hypothesis are that separate systems of accounts must be set up for investment (including production) and for consumption, since the bases of valuation adopted in the two areas of human activity are fundamentally distinct. Whereas money as a medium of exchange and as an asset takes precedence over its other functions in the consumption area, in the investment area we are interested in money as a unit of account and as a measure of value. Once this is accepted, then it becomes unnecessary to answer the question: 'Who shall value the social income?' for the social income becomes a simple aggregate of payments. The valuation problem relates solely to the national *product*; the monetary transactions which constitute the national income, and which, together with interpersonal money transfers, are a function of the national product, present virtually no separate valuation problems to confuse the analyst who is concerned with developing models for planning and control.

We must distinguish clearly between our two conceptually distinct but transactionally related areas of accounting for investment and consumption. The national product is defined as a representation in money of the social output of goods and services for a given period, divided into consumption and investment goods and services. The valuation of these objects is a critical problem, depending as it does upon expectations and other subjective considerations at the time of investment, and the possibility that these may change during the period of production. The national income is defined as an aggregate of the means of payment made available to the population in a given period, derived from the sources designated 'factor shares' in distribution theory, and which may be used for consumption or financial investment (saving). The preparation of a national product account calls for an image of the organisation and processes of production of a society; with this, the analysis can be assimilated to that of the individual production unit. This is shown in the matrix of Figure 4, where the rows represent a tolerably realistic summary of the many facets of a modern economy; the rest of the world sector is included to convert the model into a closed system.[36]

The national income account would show the factor and transfer payments on the *right-hand* side and acquisitions of goods and services from investment sources on the left; the retained earnings of corporations would not be included with the former, or sales of investment goods (or inventory changes) with the latter. The difference between incomes and acquisitions constitutes saving, which can thus fail to equal investment *ex post*; this would convert the national accounts from an identity to a set of behavioural equations and provide the analyst with an invaluable tool for planning and control decisions. We suspect that many of the false problems which have preoccupied national income statisticians would also disappear, such as: how to account for 'investment' in consumer durables; what happens to the national 'income' when the economist marries his housekeeper; or whether the national income can be truly said to have increased because a rocket launch at Cape Kennedy had to be aborted.[37]

Conclusion

The statement that the social accounts of the non-Communist countries are conceptually deficient, because they have been constructed on the basis of a Ricardian image of a preindustrial society, implies that their usefulness is highly suspect, quite apart from any weaknesses to which the data may testify and which arise out of statistical problems of collection and presentation.[38] Recent work of the United Nations on its system of national accounts, which demonstrates both the articulation of the full system and its representation in matrix form, still fails to distinguish between investment and money flows, which are combined in the various accounts in a manner wholly at variance with economic realities.[39] We have put forward suggestions for fundamental changes which we regard as necessary for the modernisation of the system, and an economic theorist may well object to so radical an approach on the grounds that the existing system is based upon a well-understood conceptual framework which, while

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[36] E. Fuerth attempted something on these lines in 'A Flow Chart for Social Accountants', *Accounting Research*, Vol. 4 (1953), pp. 214–38, but without sectorisation; he did not bring out the dependence of income upon investment.

[37] See *Measurement of National Income and the Construction of Social Accounts*, Chs. II–IV, and similar official publications.

[38] See Oscar Morgenstern, *On the Accuracy of Economic Observations* (1st ed.; Princeton, 1950), Section IV.

[39] *A System of National Accounts* (New York: United Nations, 1968), espec. Chs. II and III.

FIGURE 4
Proposed Model of the Social Product Account

Sectors	*Invest-ment*	*Equip-ment*	*Finance*	*Credit*	*Supplies*	*Costs*	*Products*	*Distri-bution*[8]	*Transfers*	*Surplus/ Deficit*
Extraction[1]										
Construction										
Manufacture										
Transportation										
Distribution										
Regulation[2]										
Stabilization[3]										
Combination[4]										
Protection[5]										
Administration[6]										
Education										
Recreation[7]										
Rest of the world										
Totals							[9]	[10]		

Notes:
[1] Agriculture, fishing, mining, exploration.
[2] Banks, produce markets, stock exchanges.
[3] Insurance, pension funds.
[4] Trade unions, employers' associations.
[5] Law courts, police and fire services, the professions.
[6] Non-specified government functions. Defence may be treated as a sector.
[7] TV, cinema, sports.
[8] Of all products, not only those of the distributive trades.
[9] National product at factor costs.
[10] National product at market prices.

incomplete, is nevertheless better than nothing. If the constituents of these theories can find their counterparts in the social accounts, then the latter can be used for testing and refining the theories. To this we can only reply by quoting from the seminal report of 1947:

> In so far as the entries in the working system fall short of some theoretical ideal, either because a compromise has been made for lack of data or because the ideal is not expressible in terms of operations which permit measurement, they will be misleading if they are used for purposes other than those for which they have been constructed. It is thus important to examine the definitions employed in order to see the limitations on the legitimate use of the system. Thus, for example, the concepts of consumer's expenditure and capital formation which seem appropriate from the point of view of distinguishing between the two principal components of the national product do not necessarily coincide with consumption and additions to wealth and such differences must be made explicit.[40]

Our proposal to separate product 'flows' from income 'flows' would make necessary the preparation of national balance sheets and wealth statements, since the dynamic elements of the former can only be considered in relation to changes in the states disclosed by the latter. It would be unwise to underestimate the difficulty of this task in the light of studies which have already been made in this area,[41] although a regionalisation of the task would undoubtedly help to render it more manageable. We may point out that our separation effects a massive simplification, since capital goods fall to be valued only in the investment accounts, and the balance sheet items of the consumption accounts are limited to financial assets and liabilities. On these items, as on the constituents of the proposed Social Product Account, data are readily available, although they could obviously be improved considerably.

We are prepared to acknowledge a limited usefulness of the social accounts prepared by free economies at the present time; there is the overriding necessity to experiment in this field, which transcends quality judgements, and there is a demonstrated use in international negotiations, as, for example, in determining appropriate contributions to the United Nations, NATO and other paranational organisations. International comparisons of income, wealth and welfare are another matter entirely; one need only consider the case of the USA whose national income and gross national product appear to have doubled during a period when its urban societies have all but collapsed, its public services have been demonstrably inadequate to cope with the needs of the population, and enormous money incomes have been made available to individual and corporate landowners to induce them not to produce goods which are nevertheless scarce in relation to individual needs. We submit that our suggested scheme would throw some light on the nature of the problem posed by these anomalies, since it would be possible to demonstrate, if such were the case, that money incomes of $900 billions had been made available at a time when the social product had a value of, say, $500 billions. The implications of such information for the attack on inflation are obvious. Whether the information can be regarded as useful, however, is in the last analysis, a philosophical question; if we believe that all planning of a social nature is contrary to the interests of the individual, then social accounting is clearly an exercise of exquisite futility. We prefer to take a position somewhat more favourable to the endeavour, by stating that a limited amount of planning has proved possible even in a free society, and that the potential benefits of such planning can be determined only by experiment and the evaluation of evidence.

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[40] *Measurement of National Income and the Construction of Social Accounts*, p. 25.

[41] R. W. Goldsmith and R. E. Lipsey, *Studies in the National Balance Sheet of the US*, National Bureau of Economic Research (Princeton, 1963); and *Measuring the Nation's Wealth*, Vol. 29, Studies in Income and Wealth, National Bureau of Economic Research, Washington (1964).

Valuation and Meaningful Accounts

John R. Grinyer and Richard W. Lewis

Introduction

A great deal of effort has recently been directed towards the provision of more meaningful accounts for shareholders and users external to the company. This has concentrated on the improved use of the established accounting model by standardisation of accounting practice with the aim of reducing the number of possible interpretations of the significance of any particular figure.

The contention of this paper is that such an approach may merely be defining more precisely figures which could be fairly meaningless to shareholders and investors, and which might be less useful for their purposes than alternatives which are less precise. Most of the paper will involve establishment of the case for change on the basis of well established arguments. There may, hopefully, be some element of originality in the final recommendations.

Throughout the article it will be assumed that the accounts are prepared primarily for the use of investors, which class includes a firm's shareholders. However, it will be seen that the method proposed will yield useful information to the creditor.

The firm's managers may also hope to derive useful information from the accounts; the analysis will deal mainly with the case of the investor, but it will no doubt be noted by the reader that many of the arguments made apply with equal force to the use of the accounts by management.

We will assume, for simplicity, a complete absence of change in the general purchasing power of money.

The Information Needs of Investors

It is possible that investors derive a variety of satisfactions from holding shares, but it is reasonable to assume that their major reason for such action is the hope of satisfaction obtained from the consumption opportunities afforded by the inflow of cash derived by the shareholder from his holding. Such cash flows would be dividends and proceeds of the sale of the share or, possibly, a terminal dividend.

The investor could, therefore, be assumed to have the objective of maximising the present value of his shareholding, i.e.

$$\text{max. } V_o = \sum_{j=1}^{n} \frac{D_j}{(1+i)^j} + \frac{S_n}{(1+i)^n} \qquad \text{(Equation 1)}$$

V_o is the present value of shareholding

D_j is the net of tax dividend in year j for the shareholding envisaged, paid at the year end

i is the investor's opportunity cost

n is the year of sale of the holding; it is assumed that shares are sold immediately after payment of the dividend in year n

S_n is the proceeds of the sale of the shareholding

It is assumed that the opportunity cost does not change during the period of share ownership.

Given the above objective, one can argue that share price 'S_n' is a function of the market expectations, at time n, of future dividends. This must mean that, if the investor assumes that other investors have the same opportunity cost and investment opportunities as himself, he could convert equation 1 into:

$$\text{max. } V_o = \sum_{j=1}^{n} \frac{D_j}{(1+i)^j} + \sum_{j=n+1}^{\infty} \frac{ED_j}{(1+i)^{j-n}(1+i)^n} \qquad \text{(Equation 2)}$$

Here ED_j is the net of tax dividend expected by the marginal investor at time n to be paid at the end of year j.

As the individual has to make his present investment decisions in the face of uncertainty, we might restate Equation 2 as:

$$\text{max. } V_o = \sum_{j=1}^{\infty} \frac{ED_j}{(1+i)^j} \qquad \text{(Equation 3)}$$

where ED_j is the dividend at the end of year j which he, the investor, expects as time 0. Given the assumption that the investor believes that other investors share his expectations.

If we assume that the risk associated with investment in the firm remains constant, and that it can adequately be reflected by inflating the rate 'i' (which latter assumption has been shown by Robichek and Myers[1] to be of doubtful validity, but is retained for simplicity), then we can argue that the information which the investor really wants is a reliable estimate of future dividends.

The provision of information which enables investors to make reasonably accurate estimates of future dividends should lead to the establishment of share prices which are reasonable approximations of the present value of future dividends, and should, therefore, tend to increase the validity of Equation 3 as the investor's decision model.

On the basis of the preceding arguments one can agree with Professor Edey[2] that profit would ideally be shown as the change in the present value of future dividends (or equivalently net cash flows after all investments – including those in working capital) between the beginning and end of the year. The change could perhaps be analysed by reference to the present value of changes in expectations of cash flows derived from business activities in existence at the beginning of the year and the present value of expected cash flows arising because of innovative management action during the course of the year. Edey points out that if this idea were used the subjective estimates of present value made by management for communication to shareholders would be used to assess the performance of that management, and implies that biasing of estimates could not necessarily be detected by audit procedures.

We have reasoned above that:

(i) Investors would ideally like to know future dividend flows derivable from shareholdings in a firm, and should benefit from dividend forecasts.

(ii) This information could be presented as a profit or loss figure, which would show the change during the year in the estimated present value of the firm, analysed by cause.

(iii) The subjective nature of information provided under (i) and (ii) casts doubt on the practical value, for reporting purposes, of the concepts summarised in (ii) above.

Possible Objective Bases for Accounting Figures

It appears that whilst the present value approach to valuation and profit measurement is conceptually attractive, it may prove of uncertain value in practice.

We have argued that investors would ideally like to predict future cash flows from the firm, and such flows must depend ultimately on the ability of the firm to generate cash by its operations over time. It may be reasonable for investors to assume that past performance is an acceptable basis for predicting future performance, and would seem unwise for them to completely ignore past events. As the past is a matter of history, it should be possible to record events, measure past values, and present a far more objective account of progress than would be possible with the present value model.

It seems reasonable to assume that shareholders wish a reliable measure of the creation of wealth by the firm during a past period which they are considering, because presumably this indicates the firm's ability to pay dividends.

How could we define a firm's wealth if we abandon the discounted cash flow type of concept? The most likely way seems to be the estimation of the total value of the property belonging to the firm and deduction from this of the amounts owed to outsiders (i.e. the liabilities), then wealth $= \sum_{j=1}^{n} A_j - \sum_{j=1}^{m} L_j$

where there are 'n' separate assets, 'm' liabilities, 'Aj' indicates the value of asset j and 'L_j' indicates the amount due to creditors in respect of liability j.

Clearly this approach defines wealth as the equivalent concept to 'capital' in the traditional accounting model.

To be objective we can only recognise those assets for the existence of which there is evidence in the form of a market transaction. We, therefore, ignore the value of managerial expertise, goodwill arising other than by purchase, and frequently the worth derived from past research and development and the possession of patents – on all of which the future of the company may vitally depend.

The practical requirement to use objective measures of asset valuation seems to be clearly implied as having 'general acceptability' by the 'prudence concept' outlined in the English Institute of Chartered Accountants' recent statement on 'Disclosure of Accounting Policies', and it seems that if we require objective values then we must be prepared to overlook many intangible assets and the distortion in aggregate asset values which this involves.

Essentially the concept of accounting profit involves calculating changes in the value of the firm's physical and monetary property, after the assumed payment of all creditors, attributable to trading operations. We shall not consider here the problem of the measurement of the amount of liabilities, which would be included in the calculation at the amounts which are expected to be paid to the creditors (and are probably determined by contractual commitments). Assets could, however, be valued on a number of objective bases as discussed by Mumford.[3]

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[1] Robichek and Myers, 'Optimal Financing Decisions', Prentice Hall 1965.

[2] H. C. Edey, 'The Nature of Profit', *Accounting and Business Research*, No. 1, Winter 1970.

An objective basis of asset valuation seems inevitably to require the use of a market price. Recognising the existence of imperfect competition and transactions costs, there will usually be two sets of prices, that at which a firm can buy and that at which it can sell an asset, the firm's position in the market involved will normally determine which set of prices is the higher. There will also be different dates in respect of which reference might be made to market prices; let us generalise and say there are two times for reference, the past and the present. The four possible market price bases which are therefore available as objective measures of asset value, are shown in the table below:

MARKET PRICES AVAILABLE AS BASES FOR ASSET VALUATION

Market Time	Purchase	Sale
Past	Historical Cost	Past Revaluation at Sale Value
Present	Replacement Cost	Net Realisable Value

Market prices available as bases for asset valuation

Readers of currently produced accounts will be aware that all four possible market price based valuation approaches are at present used. Historical cost is the most prevalent basis and, generally, present market prices are used only when these are less than historical cost and the assets involved are held for trading rather than for retention by the firm.

If we are going to use some or all of these bases of valuation in preparing accounts, it may be useful to consider how valid they are.

The arguments against the use of historical cost are well known and have been marshalled in many other places, e.g. R. S. Edwards[4] and Edwards and Bell.[5] We accept their arguments and we will not repeat them here. The main argument advanced in favour of the historical cost basis is that it is objective.[6] It is our view that, without moving too far away from the objective pole of the subjective – objective continuum, other bases can provide more useful information.

We will assume that 'the firm will continue in operational existence for the foreseeable future', which assumption the English Institute states has 'general acceptability'.[7]

Replacement Cost or Net Realisable Value?

As we are accepting the 'going concern' concept, it may be an acceptable generalisation to assume that the majority of business assets, whether held within the firm for the long or short-term, will be replaced when retired.

With the above simplifying assumption, and with the further assumption that no revenue will be lost or deferred because of the present disposal of goods, it seems reasonable to accept replacement cost as a useful basis for valuation of individual assets.

For:

1. The replacement cost is the amount by which cash balances will fall if the asset is replaced and
2. If management has the primary objective of maximisation of the discounted present value of the firm, it should not replace the asset unless it considered that it was worth, in terms of future earnings discounted at the firm's cost of capital, at least the amount of the replacement cost – so that such a cost should place a minimum value on that asset.

Even if the asset is not to be replaced by an identical replica the replacement cost may still be valid if replacement cost is defined as the replacement cost of the remaining units of service that are contained in the asset.[8]

The above arguments do not imply that sales price is necessarily irrelevant information for investors.

Past sales price could, perhaps, be dismissed as irrelevant – except possibly as a proxy measure of current sales price. The latter should, however, be of interest to investors as it provides a measure of the

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[3] M. J. Mumford, 'Objectivity and the Accounting Profession, *Accounting and Business Research*, Autumn 1971.

[4] R. S. Edwards, 'The Nature and Measurement of Income' reprinted in *Studies in Accounting Theory* edited by Baxter and Davidson, Sweet and Maxwell, 1962.

[5] E. O. Edwards and P. W. Bell, 'The Theory and Measurement of Business Income', University of California Press, 1967.

[6] Institute of Chartered Accountants in England and Wales, 'Recommendation on Accounting Principles, Accounting in relation to changes in the purchasing power of money' (N15).

[7] Institute of Chartered Accountants in England and Wales, 'Disclosure of Accounting Policies', *Statement of Standard Accounting Practice*, No. 2.

[8] W. T. Baxter, 'Depreciation', Sweet and Maxwell, 1971.

'break-up' valuation of the firm, assuming that the sale value was taken on the basis of sale in the near future. Such a valuation places a minimum value on the firm if the investor is justified in assuming that management would discontinue the business if it could not obtain a return on the break-up valuation at least equivalent to that which the shareholders could earn elsewhere. Even if this last assumption is unrealistic, it could still be claimed that the sale values of assets are meaningful as indicating the underlying security provided by the firm's assets. H. C. Edey[9] suggested, in 1963, that presentation to investors of information concerning the sale value of assets would be valuable, and indicates further reasons why this might be useful.

It could be argued against the use of sale values for profit calculations:

1. That as the firm can typically buy trading assets at less than it can sell them for, the valuation basis is not very meaningful for such assets, particularly as it would enable management to show book profits merely by purchasing additional stock. This is a valid comment, and the use of sale price for valuing trading assets violates the 'prudence concept'[7] to an extent which seems generally unacceptable.
2. That the estimation of the sale value of fixed assets is likely to involve an unacceptable degree of subjectivity. This comment has less validity than (1) above. Observation indicates that frequently managers are able to provide estimates which seem to be better approximations of the sale values sought than are given by the historical purchase prices currently used for the valuation of most assets. To justify the provision of information different to that currently provided one does not have to prove its accuracy, but merely to show that it is more useful than the alternative it is replacing – thus inaccurate information seems acceptable if it is both acknowledged to be a rough approximation and is more meaningful than the information it supplants.

We can, therefore, argue that at least some sale values might be meaningful in establishing the firm's 'wealth', and hence for profit measurement.

The Aggregation of Asset Values

On the basis of the above reasoning, it would appear that it might be possible to use either replacement costs or current selling price as a basis for profit calculations. Which of these is preferable? Of course it may be that the best approach is to prepare multi-dimensional accounting statements, i.e. using both replacement costs and selling prices.[10] We will not fully enter this argument here but we will show below that serious doubts can be raised against the use of aggregate replacement costs and we have already referred to the difficulty of using the selling price basis for valuing trading assets.

The choice should depend on which concept provides the most meaningful measure of profit for shareholders, and resolution of this problem requires us to return to the 'objective' profit concept.

It will be recalled that profit was defined as the increase in wealth (or capital) by reason of trading, and that measurement of wealth involved the aggregation of asset values. Let us consider how meaningful the aggregate figure is under the different valuation concepts, because if the aggregate is meaningless as a measure of the firm's worth then presumably so is the derived profit as a measure of the firm's progress.

It has been argued above that replacement cost would provide a meaningful basis for valuing individual assets but, unfortunately, it might not provide a very meaningful figure of total asset value.

Consider a group of mutually dependent assets. If one asset has to be replaced the decision will be based on the replacement cost of that asset and the scrap values of the remaining assets (if we assume that disposal is the only alternative use of those assets). The decision will not be based on the aggregate replacement costs of the assets. An example might be helpful to clarify the above point. Say we have a mutually dependent group of three machines, one of which, A, has been destroyed. The replacement costs and selling prices of the machines are:

Machine	*Replacement Cost*	*Selling Price*
A	£200	£15
B	£100	£20
C	£120	£30

Assume that this group of machines produces a stream of cash flows which has a present value of £400.

It can be seen that machine A would be replaced since the cost is only £250 (the replacement cost of machine A plus the opportunity costs of machines B and C).

Similarly, it could be shown that machines B and C would also be replaced if they were destroyed.

However, if we were starting from scratch, the three machines would not be purchased since the total cost of £420 is greater than £400.

It is argued that the above objection does not generally apply to the aggregation of the replacement costs of current assets since these assets are not, in general, mutually dependent in the above sense.

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[9] H. C. Edey, 'Accounting and Business Reality', *Accountancy*, Vol. 74 (1963). Reprinted in Carsberg & Edey 'Modern Financial Management'. Penguin, 1969.

[10] H. M. Bedford and J. C. McKeown, 'Comparative Analysis of Net Realisable Value and Replacement Costing', *The Accounting Review*, April 1972.

Since aggregate replacement costs provide doubtful figures for many types of fixed assets, we should look for an alternative valuation basis. Does sale price provide a more meaningful measure?

As argued above, the aggregate of sales values of individual fixed assets is meaningful as it provides an indication of the underlying security in the business, both as an 'exit' figure for the firm as a whole and as security for loans to the firm. The significance of the figures appears to be unambiguous. Although there may be a significant element of approximation in deriving them, we think that the aggregate of sales values of fixed assets is likely to prove a more useful figure than would the aggregate of replacement costs, which only becomes meaningful if the firm can be assumed to be prepared to replace all of its existing assets at the same time, given the need and means to do this. The latter situation would seem to be, in many cases, unrealistic and we shall not consider it further.

A Proposed Valuation Basis

We put forward the following proposals in the hope that they will stimulate discussion and help in the development of accounting practices which provide, on the basis of data sufficiently objective to be generally acceptable, information more meaningful than that currently supplied by accounts.

Our proposals are:

(1) that fixed assets should be valued at their net realisable value and

(2) that current assets should be valued at replacement cost (or net realisable value if it is less than the replacement cost).

Of course the above give rise to the question of what should be done with the difference between the historical cost and the net realisable value of fixed assets. Should it be written off against profit in the period in which the asset is purchased or should it be written off against profit over the life of the asset?

It is our contention that the difference between the historical cost and the net realisable value may be viewed as an investment by the firm in a particular technology used for a particular market (we shall call this difference the 'specific investment'). The firm may be able to put the asset to other uses, in such cases, e.g. motor vehicles, where the assets are not highly specific, the differences between the replacement cost and the selling price may not be very large. It is when we consider highly specific assets that we are likely to see significant differences and it is possible that in these cases the alternative uses may well be extremely restricted.

In each accounting period any fall in the net realisable value of a fixed asset would be transferred to the appropriate specific investment account. If the net realisable value increases a reverse entry would be made.

The advantages of not writing off the specific investment in the period in which it is made include:

(*a*) Some indication is given of the firm's specific investment in a particular technology/market. This could be specially useful in the case of a multi-activity firm which could show the balance of its specific investment divided between the different activities. The users of the accounting statements could make their own estimates of the firm's ability to recover the specific investment based on their views of the likelihood of major technological changes, etc.

(*b*) The method could be used to provide a better proxy of the firm's estimate of the present value of future cash flows than a method which reported only the net realisable value of fixed assets. It may be useful to view the specific investment section of the Balance Sheet as a vehicle for the directors to use for communicating their views as to the future prospects of the firm's various activities. If the directors feel that the prospects of a particular activity are now such that it is unlikely that the specific investment would be fully recovered, they could make a special write off of the specific investment in that activity. Such a write off would be subjective but it would be clearly shown as such.[11]

(*c*) A firm which invested in a highly specific asset would not report a less favourable change in owners' equity than would a firm which had invested in a less specific (and probably less efficient) asset. But the accounting statement would indicate that the former company had made a larger specific investment and had placed itself in a less flexible position than had the latter firm.

We suggest that the Profit and Loss Account be split into sections for trading and investment as illustrated in the Appendix. The trading section would be similar to the existing Profit and Loss Account, except that it would contain no 'depreciation' figures with the result that trading profit would almost be the figure which many financial analysts currently derive by adding depreciation to net profit. The specific investment section would provide useful information by showing the amount of shareholders' funds which management had irrevocably committed to investments during the year.

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[11] The thought that a reverse entry could be made if the directors' expectations of the future of a particular activity were improved is an attractive one, but we recognise that such a suggestion would attract little support at the moment and would involve considerable practical difficulties. Basically we are suggesting that there could be a subjective section of the balance sheet which would be used to show the difference between the objective aggregate value of the assets and the directors' estimate of the present value of future cash flows, the corresponding adjustments in the Profit and Loss Account being clearly shown as being due to changes in expectations.

It will be noted that our proposals could be implemented in, at least, two ways.

With one method the specific investment would be written off on the basis of the expected lives of the fixed assets using traditional depreciation methods. Thus over time the difference between the historical cost and the scrap value of an asset would be written off through the specific investment account. This of course means that we do not escape the problems of measuring depreciation. However, the manner in which the unexpired balances of the fixed assets would be shown (the 'objective' part in the fixed asset section, the 'subjective' balance in the specific investment section) means that more useful information would be provided than that which is currently produced.

The profit figure that would be disclosed would differ from the profit that would be produced by the system currently used in the UK only because of the valuation of the current assets on a replacement cost basis and, possibly, because of a different depreciation pattern.

An alternative method would take a bolder line, the specific investment would only be written down if management believed that the balance on a particular specific investment account plus the net realisable values of the appropriate fixed assets was greater than the net present value of the cash flows that would arise from the particular activity. The result of such a procedure is that the balance sheet should, in general, provide a better proxy of the net present value of future cash flows than would a balance sheet constructed using the first method, but at the cost of greater subjectivity. However, the manner in which we suggest that the Balance Sheet and Profit and Loss Account be presented would show clearly what data was reasonably objective and which was more subjective.

Conclusion

The proposals outlined in this paper are open to criticism. Reliance on objective measures of value inevitably excludes from the Accounts many significant intangible assets, and the economic value of a successful business is unlikely to be even approximated by the Balance Sheet figures. On a practical basis auditors might rightly claim that the figures resulting from the proposals would be more difficult to check,

It seems likely that the information derived from the implementation of the proposals would be more meaningful than that provided by the Accounts currently prepared. The proposals would lead to the provision of trading information basically similar to that found in existing Accounts, the major changes would be in the Balance Sheet figures of Fixed Assets and in the treatment of depreciation and deferred revenue expenditure.

Opinions will inevitably differ concerning the desirability of change in our accounting practices – it must be beneficial, however, at this time of reappraisal of former practices, if we rigorously reconsider not only the niceties of implementation of 'accepted' principles and practices, but also their validity.

Appendix

This appendix illustrates a way of applying our proposal. For simplicity we assume that the general level of prices has remained stable throughout the period being considered, and an absence of taxation.

and

A.B. is a manufacturing company operating in two separate major markets.

At the beginning of the accounting year its Balance Sheet was as follows:

	£m		£m	£m
Share capital	1·5	*Fixed Assets* – at net realisable value		
Reserves	1·8	Consumer durables	1·4	
	—	Industrial sector	0·6	
	3·3		—	2·0
Current liabilities	0·5	*Current assets*		
		Stock – at the lower of net realisable value or replacement cost	0·5	
		Debtors	0·4	
		Cash at Bank	0·2	1·1
			—	—
		Value of realisable assets		3·1

	Specific investments		
	(Not immediately realisable)	£m	£m
	Consumer durables	0·5	
	Industrial sector	0·2	
			0·7
3·8			3·8

During the following year the undermentioned movements in asset values occurred:

Stock	*Input value*	*Replacement cost at time of use or closing balance sheet date*	*Holding gain/loss*
	£m	£m	£m
Opening stock	0·5 (replacement cost)	0·6	0·10
Acquired and used during the year	5·0 (amount paid)	4·8	(0·20)
Held at year end	0·4 (amount paid)	0·45	0·05
			£ (0·05)

Fixed assets	*Input value*	*Proceeds of sale or realisable value at balance sheet date*	*Transfer to specific investment account*
Consumer durables sector			
Held at commencing date	£m	£m	£m
Sold during period	0·05 (opening realisable value)	0·04	0·01
Retained at end of period	1·35 (opening realisable value)	1·20	0·15
	1·40		
Purchased during the year	0·50 (historic cost)	0·30	0·20
Closing balance sheet figure		1·50	
			0·36
Industrial sector			
Held at commencing date and retained at end of period (There were no purchases or sales of fixed assets in this sector during the year)	0·6	0·55	0·05
	0·6		
Closing balance sheet figure		0·55	
			0·05

Statement of movements in specific investment	*Consumer durables*	*Industrial sector*	*Total*
	£m	£m	£m
Investment at commencement of year	0·50	0·20	0·70
Add: Transfer from fixed assets	0·36	0·05	0·41
	0·86	0·25	1·11
Less: Decline in value of investments during the year	0·36	0·03	0·39
Amounts shown on closing balance sheet*	0·50	0·22	0·72

* As mentioned in the article, this could be derived by either

(*a*) the application of a conventional type of depreciation policy, or

(*b*) a subjective valuation by management.

Whilst we prefer alternative '*b*', we recognise that this may not be as readily accepted by practitioners as is '*a*' – but that a possible compromise might be:

(*c*) the lower of unamortised historical cost or of directors' valuation.

The description of this item in the accounts would clearly depend on the 'valuation' alternative chosen.

Closing balance sheet values would be

Balance sheet at year end

	£m		£m	£m
Share capital	1·50	*Fixed assets* – valued at net realisable value		
		Consumer durables	1·50	
		Industrial sector	0·55	
				2·05
Reserves	2·02	*Current assets*		
		Stock (valued at replacement cost)	0·45	
	3·52			
Current liabilities	0·45	Debtors	0·50	
		Cash at bank	0·25	
				1·20
				3·25
		Specific investment		
		Consumer durables	0·50	
		Industrial sector	0·22	
				0·72
	3·97			3·97

and the account showing the result of operations for the year would be in outline as follows:

Statement of Profit or Loss

	£m
Trading profit (before holding gains or losses on stock, or cost of utilisation of fixed assets)	0·86
Net Losses from holding stock	0·05
	0·81
Less: Reduction in investment attributable to the holding and/or use of fixed assets	0·39
Net profit for the year	0·42

Statement of movement in reserves

Opening balance	1·80
Add: Net profit for the year	0·42
	2·22
Less: Dividends paid and proposed	0·20
Closing balance	2·02

Post-Auditing the Capital Investment Decision – A Strategic Extension

Edward J. Lusk

Introduction

Post-auditing the capital investment decision is a necessary but oftentimes overlooked element in the investment evaluation process. As Hicks and Schmidt (4) note:

> 'The analysis of variances (from expected investment performance) should prove useful in the sense that it will force the estimators (of the characteristics of investments, payback, DCF, etc) to question the assumptions upon which their future estimates are made.'[1]

The post-audit is intended to reveal the validity of the estimated performance of investment relative to the strategic planner's explicit investment criteria (i.e. payback, DCF, etc). As the authors note, the learning that may occur by requiring these comparisons may be valuable in refining the investment process. For example, the strategic planner may feel that the Discounted Cash Flow (DCF) is an important characteristic (among others) which should be estimated by the manager proposing an investment. This estimated DCF will be used by the strategic planner in ascertaining which of the investments suggested during the capital budgeting cycle will be funded. If the DCF is projected in an investment proposal to be $45,000 and during the evaluation period the investment's DCF is estimated to be $30,000, this deviation may be analysed and corrective action may be undertaken.

The scope of these post-audit procedures are tactical in nature in that the strategic resources have been committed and now specific tactical alternatives are considered to correct the deviation from the measured criteria. To complement these tactical post-audit procedures, the organisation's strategic planners may be interested to analyse the funded and rejected investments to ascertain which of the evaluation criteria the planners have actually been most sensitive to in allocating investment funds. The analysis suggested to generate this information is a linear discriminant analysis.[2]

Linear discriminant analysis

Discriminant analysis is a mathematical technique which isolates the relative weights of specified variables for a group of classified data. (Tintner (5)). In the case of the investment proposals formalised during the capital budgeting cycle (in consideration of the explicit criteria) the classification is funded or rejected for funding. Therefore, after funds have been allocated, the following information has been generated (Table 1):

This information is inputed to a discriminant analysis, and the output of that analysis is a function which has the property that it may best discriminate among the investments regarding the funding process. Therefore the function generated by the discriminant analysis may be used to classify an investment as funded or rejected, and when this discriminant classification is compared to the actual investment decisions made by the strategic planner, the set of discriminantly classified investments would contain a minimal number of misclassifications. A misclassification would occur when the discriminant function placed an investment in the wrong group,

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[1] Carl F. Hicks Jr, and L. Lee Schmidt Jr, 'Post Auditing the Capital Investment Decision', *Management Accounting*, August 1971, p. 28. (Parentheses added for clarification.)

[2] 'Linear discriminant analysis is an appropriate technique of analysis when the criterion variable is expressed categorically and the predictor variables are interval scaled.' Green and Tull (3). In our study we have intervalised the predictor variables and the criterion variable is dichotomous – accepted/rejected.

Further we tested the hypotheses that the covariance of the accepted and rejected groups is significantly different. Using the Box (1) test at $\alpha=0{\cdot}01$ we could not accept this hypothesis. This is important since one usually asserts that a linear form of discriminant function is reasonable when the group covariances are not significantly different.

TABLE 1
Classification of investments funded/non-funded

	Strategic evaluation variables		
	Payback	*Net present value*	*etc.*
Funded investments			
I(A_1)	xxx	xxx	xxx
I(A_2)	xxx	xxx	xxx
│	│	│	│
I(A_n)	xxx	xxx	xxx
Non-funded investments			
I(R_1)	xxx	xxx	xxx
I(R_2)	xxx	xxx	xxx
│	│	│	│
I(R_m)	xxx	xxx	xxx

i.e., an investment actually funded was classified by the discriminant function as rejected or vice-versa.

However, useful as the discriminant function may be in replicating the actual investment decisions made by the strategic planner, the utility of the analysis insofar as the post-audit of the investment decisions is concerned seems to rest with the analysis of the coefficients of the discriminant function. These coefficients are the ranked weightings of the investment criteria to which the strategic planner seems to be responding regarding the funding of investments. Therefore, if the coefficient representing an investment's payback was large relative to the other coefficients, that information would imply that the variable is given prime consideration in allocating investment funds. On the other hand, if a coefficient is negative the corresponding variable adversely affects the allocation of funds. Therefore the coefficients may be analysed to evaluate the ex-post responses of the strategic planner relative to the ex-ante criteria suggested as important in funding investments. At this point an example may be useful in elucidating these concepts.

AN EXAMPLE

Assume that the strategic planner has suggested four investment guidelines (G_1, G_2, G_3, G_4) and has indicated the following cut-off magnitudes:

Criteria	*Suggested Cut-off*
G_1 represents the Payback Period (PB)	Not to exceed 8 years
G_2 represents the Net Present Value (NPV)	In excess of $20,000·00
G_3 represents the Internal Rate of Return (IRR)	In excess of 5 per cent
G_4 represents the Community Benefits of the Investment (CB)	Must be positive[3]

These criteria will serve as the guidelines used by the divisional managers to screen their divisional investments. The relevant inputs to the discriminant analysis are represented in Table 2.

The output (Dixon (2)) of the discriminant analysis (the discriminant function D(x)), which will be used to post-audit the strategic planner's sensitivities to the four criteria, is:

$$D(x) = -{\cdot}069(PB) + {\cdot}167\,(NPV) + {\cdot}014(IRR) - {\cdot}085(CB).$$

Interpretation of the discriminant function coefficients

The largest coefficient relates to the NPV which means that the net present value is considered by the strategic planner as the most important variable in the allocation of funds. Consequently the larger the net present value the more likely the strategic planner is to consider the investment a desirable funding opportunity.

The strategic planner is secondarily sensitive to the payback period, and the longer the payback period the less likely the investment will be funded as indicated by the negative coefficient.

Relative to the other variables, the internal rate of return is minimally important in differentiating among the proposed investments. The reason for this may be the arbitrary internal allocation of asset basis, revenue inflows, and costs required to compute the internal rate of return. For whatever reason, the strategic planner does not seem to rely upon this variable in allocating investment funds, which may indicate that dropping it as a required computation would be reasonable.

The community benefits (CB) negative coefficient indicates that the strategic planner is not actively concerned about the company's image *vis-à-vis* the

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[3] The community benefits may be measured in terms of minority employment opportunities, contribution to the tax basis of the community, etc. Assume that the strategic planners have established the quantitive guidelines and that an internal scale has been established where 10 is a high degree of community benefits while 0 is a low degree of community benefits.

TABLE 2
Categorised investments and their measured criteria

	Strategic planner's investment criteria			
	Payback period (years)	*Net present value (000)*	*Internal rate of return (%)*	*Community benefits*
Funds allocated				
Investment				
I(A_1)	4·1	133	9	2
I(A_2)	6·0	86	16·5	6
I(A_3)	3·0	255	14	4
I(A_4)	4·7	92	9·8	3
I(A_5)	2·0	124	7·6	3
Funds not allocated				
Investment				
I(R_1)	7·8	46	12	5
I(R_2)	4·5	30	24	5
I(R_3)	5·8	234	7·6	6
I(R_4)	8	70	9	10

community's perception of the intrinsic worth of the investment. Consequently the strategic planner in placing a negative weight on a positive community benefit seems to discourage investments which are 'community oriented'.

Given this information, the strategic planner's fund allocation role may be post-audited. The nature of this strategic post-audit is to evaluate the consistency of the strategic planner's funding rationale with respect to the explicit criteria suggested as defining a desirable investment. In the example provided above, the strategic planner seems to place the main emphasis on the net present value and the payback while almost disregarding the internal rate of return. Further, the strategic planner is behaving inconsistently regarding the investment's community benefits in that it is implied by the investment criteria that the greater the community benefits the better the chance for fund allocation. However, when allocating funds the strategic planner adopts a contradictory posture. These funding inconsistencies may stimulate an analysis of the propriety of certain of the explicit criteria. The result of such an analysis may be to either reduce the criteria by dropping the irrelevant and inconsistent criteria, or require the strategic planner to conform to the criteria in selecting investments for funding.

Summary

In post-auditing the investment's conformation to the established strategic criteria the managers of the organisation may isolate deviations and thereby effect corrective actions. To complement these tactical measures, this paper has presented a way of analysing the consistency of the strategic planner funding rationale relative to the explicit investment criteria.

In combination the tactical and strategic post-audit procedures may provide a richer description of the manner and effectiveness of the funding of investments.

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Accounting as a Scientific Endeavour: Some Questions the American Theorists tend to leave unanswered

Ian Tilley

Accounting theory is now clearly an area which is receiving much more attention from accountants than at any other previous time. It might not yet be appropriate to regard this new emphasis as a clear indication that accounting has 'come of age' but certainly this concern for more rigorous, more compelling explanation encourages most of us to believe that it is really gaining in intellectual stature and maturity.

And, yet, despite the post-War 'boom' in accounting theory formulation, some academic accountants are becoming increasingly frustrated by the type of progress they are making. Theoretical alternatives to Historical Record Accounting have been in existence for some time and yet, by-and-large, they have been ignored. In addition, accounting theorists have tended to concentrate more on sketching their own 'solutions' to the problem than seeking out appropriate validation and verification techniques from which the quite wide spectrum of competing 'theories' can be evaluated.

Recent Proponents of Accounting Science

When a Committee of the American Accounting Association in their recent report on 'Accounting Theory Construction and Verification' stated that:

> Until recently, accounting theory largely consisted of a set of competing *a priori* arguments about the relative merits of alternative accounting measurements.[1]

I believe they were clearly voicing their frustration at what they viewed as the rather sterile, pointless debate that many theorists had been engaged in for a considerable number of years. They saw it as pointless because, by its 'nature', it could *never* be conclusive. It was unrelated to the empirical world and depended on the acceptance of other unstated assumptions, the validity of which was placed beyond dispute. It often depended on what Louis Goldberg terms 'point of view' or 'viewpoint', the status of which he outlines as follows:

> . . . a point of view is essentially a personal and individual matter. When we say that we consider something from another's point of view, we mean that we imagine ourselves in that other's place and attempt to consider the subject-matter as we think *he* would consider it.[2]

The outcome of this is not only that accounting is in no way empirical but, as it is asserted or implied that *such viewpoints are beyond inquiry, the debates must reach stalemate quite quickly.*

The response of the AAA Committee on Theory Construction and Verification to this unfortunate situation is to spearhead the attack on the 'metaphysical' accounting theorists and declare that an increasing number of American researchers are engaged in 'attempting to establish an empirical tradition'[3] in accounting theory. They proceed to specify what they mean:

> Thus the choice among alternative hypotheses must be determined by which abstraction better captures the *relevant* aspects of reality. It is impossible to resolve such an issue on an *a priori* basis. There is a need for some external method of verifying whether or not an abstraction is a 'good' one.[4]

The 'external method of verifying' is in fact 'the scientific method'.[5] Thus, they wish to convert accounting from the realm of 'nonempirical science' to 'empirical science' by applying 'the scientific method'.[6] I will not take the discussion of the Committee's proposal any further at this stage but rather briefly mention several other prominent writers who argue, broadly speaking, to a similar general conclusion.

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[1] Report of the Committee on Accounting Theory Construction and Verification, *Supplement to Accounting Review*, XLVI (Evanston, Ill.: American Accounting Association, 1971), p. 77.

[2] Louis Goldberg, *An Inquiry into the Nature of Accounting*, American Accounting Association Monograph No. 4, (Iowa City: American Accounting Association, 1965), p. 109.

[3] Report on Accounting Theory Construction, *op. cit.*

[4] Ibid.

[5] Ibid.

[6] See ibid., p. 56.

There has been a considerable number of theorists from around the Second World War period and beyond who have talked about scientific accounting and yet, to some degree at least, what is adduced in support of their views is sometimes not very convincing. Oehler sees accounting theory as scientific; he offers no explanation.[7] Norris (who is not an American) however, takes a slightly different position:

'I think we may reasonably say that accounting has attained the status of a science which has as its practical counterpart the art of accounting.'[8] Nothing is presented here either to substantiate this belief. However, he does attempt to console those who do not agree with him by offering the thought, which is considered later, that the question is of little real importance anyway: '... this should be a difference only of words ...'[9]

In the last decade, particularly, there has been a revival of interest in investigating accounting scientifically.[10] A principal advocate for the raising of accountancy to the level of science is R. J. Chambers. He argues that:

> The particular function of accounting, the discovery of the facts which at any time predict the limits of action, is thus strictly a scientific function; a continuous research function, inasmuch as the facts are continually changing. Its process will necessarily be carried out with the same detachment from the facts, and the same pertinacity in seeking the facts as any other form of scientific inquiry.[11]

The AAA Committee which reported on the 'Foundations of Accounting Measurements' said that perhaps accounting should be what they termed an 'administrative science' basing its theory and its measurements on sociology, psychology, economics and engineering. They take this to be the major intent behind Chambers' study.[12]

Some Unanswered Questions

There are major writers centred in the US (or primarily read by American accountants), who argue that 'the scientific method' should now be related to our discipline by theorists in such a way as to define '... a framework within which meaningful, theoretical and empirical research can be conducted.'[13]

If we agree with Kuhn,[14] then this new perspective may herald a 'revolution' in accounting thought. My concern, however, is rather with a whole host of important questions that need to be examined *before* one looks seriously at the 'framework' and certainly *before* one attempts to elaborate the structure offered to us by the Committee and others arguing a similar position. The questions that I propose to take up here are hardly exhaustive but I consider that they could be interesting in terms of evaluating the unstated assumptions which the current 'scientific accountants' bring to *their* work.

(1) Are these researchers saying anything new to propose that accounting theorists adopt 'the scientific method'? As I will briefly indicate that scientific accounting has been in and out of fashion since the turn of the century at least, it seems worth asking:

(2) What was the effect of this way of conceiving accounting theory in the past? What is the status of Historical Cost Accounting viewed in these terms? Did this view lead to new and interesting avenues of inquiry?

(3) Are the suggestions offered on scientific accounting in this decade arguing for similar ideas?

(4) As their perspective implies an understanding of 'science' and 'the scientific method', do these notions have a clear meaning and, if not, what implications flow from that? In particular,

(*a*) What is the nature of science?

(*b*) What distinguishes a science from a non-science? What conditions are both necessary and sufficient to warrant labelling a field of study as science?

(*c*) What are the benefits science offers over non-science?

(*d*) Finally, can a useful distinction even be made between what is scientific and what is not?

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[7] Christian Oehler, 'Theory and Practice', *Accounting Review*, XVII (January, 1942): p. 278.

[8] Harry Norris, *Accounting Theory: An Outline of Its Structure* (London: Sir Isaac Pitman & Sons Ltd., 1946) [emphasis added].

[9] Ibid.

[10] The interested reader could refer to such articles as Dwight P. Flanders, 'Accountancy, Systematized Learning, and Economics', *Accounting Review*, XXXVI (October, 1961); Nicholas Dopuch, 'Metaphysics of Pragmatism and Accounting', *Accounting Review*, XXXVII (April, 1962); W. J. Schrader, 'An Inductive Approach to Accounting Theory', *Accounting Review*, XXXVII (October, 1962); Milton M. Spencer, 'Axiomatic Method and Accounting Science', *Accounting Review*, XXXVIII (April, 1963); R. K. Mautz, 'Accounting as a Social Science', *Accounting Review*, XXXVIII (April 1963).

[11] Raymond J. Chambers, *Accounting, Evaluation and Economic Behavior* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc, 1966), p. 367.

[12] Report of the Committee on Foundations of Accounting Measurements, *Supplement to Accounting Review*, XLVI (Evanston, Ill.: American Accounting Association, 1971), p. 47.

[13] Report on Accounting Theory Construction, *op. cit.*, p. 79.

[14] Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962).

Past Attitudes Towards Scientific Accounting

Accountants have looked at the question of whether their discipline is scientific since at least the beginning of this century. Several trends can be seen. Nelson[15] points out that during the early part of the twentieth century there was 'widespread belief' that the science of accounting actually existed. It seems that accountants attempted to force accounting into a scientific mould in response to a number of pressures which they felt. The early 1900s were the beginning of the rapid rise in scientific knowledge with a resultant increase in the prestige of science. The effect of this was that the virtue of scientific accounting became irresistible to many accountants.

Events in the 1930s destroyed the faith of many in accounting as a science. This was because they conceived science as completely precise and objective and they saw clear evidence that accounting was achieving neither of these tests. By the end of the Great Depression many accountants refused to consider seriously whether accounting was scientific. The argument, couched in the terms – accounting: art or science? – became worn-out and seemingly quite unimportant to them. Consequently there were only isolated, rather minor instances of interest in this way of conceiving accounting until the recent upsurge of interest in American academic circles.

In reaction to the attempt early this century to establish accounting science,[16] however, there were several writers who attempted to show the unscientific nature of accounting as it was then practised and thence the futility of talking about scientific accounting.

As Deinzer observed:

> An outmoded notion that is frequently found in contemporary accounting literature is that natural or scientific laws are made by the Prime Mover, and are 'fixed' and 'immutable'.[17]

This was the basis of many of the arguments against the notion of accounting science. A. C. Littleton, one of the most well-known writers of that time, argues this way:

> It is clear that accounting theory cannot justifiably be said to consist of scientific explanation. There are no immutable laws of accountancy comparable to the immutable laws of Nature; there are no laboratory tests and controlled experiments to yield data which may be set up as mathematical formulas to express existing relationships.[18]

The Journal of Accountancy reflected a similar understanding (or, perhaps, it would be more apt to say misunderstanding) of the nature of the science:

> In the search for a comprehensive statement of accounting principles which can achieve general acceptance, it should always be remembered that such principles can neither be derived from natural laws nor tested by scientific experiment. They are strictly man-made.[19]

It would seem that to accept the views of Littleton or this editorial, the scientific status of not only accounting but at least all the fields of the 'social sciences' would have to be denied! Several accountants have argued along quite different lines and still found accounting wanting as a scientific endeavour. Gruneberg claims that many accountants have based their support for scientific accounting on the view that accounting is systematic. This, he feels, is not a sufficient condition of science. To him '. . . the principle of logic and *the method* of science to be applied are the criterion'.[20] On these grounds he must reject the claim that the accounting of his day was scientific. Kelley too, cannot see accountancy as a science. He believed that it was moving in that direction and for this reason he termed it a 'semi-science'.[21]

The important issue here is that a significant group of American researchers believe that their field, at least in the 1970s, has attained scientific status. It is quite clear that to aspire to the idea of accounting science is not new. In the past it has failed to produce useful insights into accounting, far less succeed in its objective: creation of the science of accounting. It failed basically because there seemed to be a total lack of concern for referring theoretically-held propositions to empirically-gathered evidence. The result is that the field of accounting is littered with a host of untested speculations which no science could ever tolerate. Chambers' general criticism of conventional accounting theory is accepted here:

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[15] Edward G. Nelson, 'Science and Accounting', *Accounting Review*, XXIV (October 1949), 354–59.

[16] See such writings as Maurice E. Peboubet, 'Art or Science', *Accounting Review*, XX (October, 1945), 394; Henry C. Bentley, *The Science of Accounts* (New York: The Ronald Press Company, 1911).

[17] Harvey T. Deinzer, 'Explanation Strains in Financial Accounting', *Accounting Review*, XLI (January 1966), p. 26.

[18] A. C. Littleton, *Structure of Accounting Theory*, American Accounting Association Monograph No. 5 (Columbus, Ohio: American Accounting Association, 1953), p. 135. It is rather interesting that in his *Essays on Accountancy* (Urbana, Ill.: University of Illinois Press, 1961), p. 378, he reached the reverse conclusion on rather shaky grounds, that is, accountants have a 'scientific approach'.

[19] Editorial, 'Accounting Research Study No. 7', *Journal of Accountancy*, CXIX (March 1965), p. 27.

[20] Curt Gruneberg, 'Is Accountancy a Field of Science?', *Accounting Review*, XXV (April, 1950), p. 161 (emphasis added).

[21] Arthur C. Kelley, 'Is Accountancy a Science?', *Accounting Review*, XXI (September, 1941), p. 234. Ten years later he still cannot see accounting as scientific because it is not testable. See his article 'Can Corporate Income be Scientifically Ascertained?' *Accounting Review*, XXVI (July 1951), p. 298.

> The student of any other discipline may find it strange that the literature of accounting lacks the familiar signs of scientific discourse. Even though the subject has been rescued from declining into dogma, it is still difficult to trace the elements of logical and methodical inquiry through the writings of its exponents. The general treatment of the subject is lacking in rigour. There are many categorical statements which ought to be recognised as hypotheses only; there are some examples of inductive and deductive reasoning, but few examples of the systematic use of both to test or to support a hypothesis; there are many examples of value judgements masquerading as reasoned conclusions.[22]

The Decision Model Perspective for Accounting Science

The basic assumption underlying all present-day *financial* accounting is that it is possible to produce general purpose accounting reports which will, in the main, satisfy the bulk of their users' accounting information needs.[23] Such an approach depends on such notions as the 'typical user' and the type of decisions he might make and, consequently, the information he 'ought' to have supplied to him.[24] The unfortunate point is that such notions are fictions. The 'typical user' and his 'typical decisions' are nowhere to be found.

Several accountants have pointed out how unrealistic the conventional view is:

> The wide variety of potential users for general purpose reports and the diverse – and possibly irrelevant – influences governing the form and content of these reports make it difficult to envision a *single* set of published statements so structured as to simultaneously provide all necessary information to all users.[25]
>
> But accounting analysis often is emasculated when it applies general-purpose financial figures in a specific situation to which they do not necessarily fit.[26]

In fact, in managerial accounting, the well-accepted notion of 'different costs for different purposes' and, in financial accounting, the increasing acceptance of the view that income is not one, but a set of concepts,[27] are both evidence of an admission within accounting that general purpose reports do not adequately meet users' information needs.

The essence of the new approach to accounting is to reject general purpose reports and to insist that '. . . financial data should be tailored to the needs of users'.[28]

The Committee of the American Accounting Association which examined 'Basic Accounting Theory' argued:

> . . . the diversity of uses and the lack of prior knowledge of the decision models involved indicate the desirability of a method of reporting that permits use of detailed information that has the potential for satisfying many different informational needs.[29]

The degree of interest in their approach is evidenced by the various quite lengthy reports by special committees of the Association[30] as well as private researchers in universities, all of whom have examined it closely.

Using both mathematics and social science to provide techniques for abstracting the key elements of decisions is seen by Horngren as 'the essence of change'. The point is that '. . . the decision process became the starting point for analysis'[31] whereas under general purpose accounting, it is virtually ignored.

The AAA Committee on Theory Construction, started from the view[32] that accounting would be based on decision models and these

> decision models utilize both empirical and theoret-

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[22] R. J. Chambers, 'A Scientific Pattern for Accounting Theory', *Australian Accountant,* XXV (October 1955), p. 429.

[23] As Lawrence Revsine so aptly expresses it: 'The sacrosanct notion of *general purpose* financial reports consitutes the heart of traditional reporting philosophy.' See his 'General Purpose Reports and Users' Data Needs, *Financial Analysts Journal,* (September–October, 1969), p. 37.

[24] William J. Vatter, 'Obstacles to the Specification of Accounting Principles' in *Research in Accounting Measurement,* ed. by Robert Jaedicke, Yuji Ijiri and Oswald Nielsen (Mensha, Wisconsin: American Accounting Association, 1966), p. 8.

[25] Revsine, *op. cit.,* p. 38.

[26] Colin Park, 'Thought Processes in Creating Accounting', *Accounting Review,* XXXII (July 1958), p. 442.

[27] R. L. Mathews, 'Income, Price Changes and the Valuation Controversy in Accounting', *Accounting Review,* XLIII (July 1968), p. 512.

[28] John L. Carey, *The CPA Plans for the Future* (New York: American Institute of Certified Public Accountants, 1965), p. 169.

[29] Committee to Prepare a Statement of Basic Accounting Theory, *Basic Accounting Theory* (Evanston, Ill.: American Accounting Association, 1966), p. 31.

[30] In addition to the Reports on Foundations of Accounting Measurements and on Accounting Theory Construction, *op. cit.,* prior to this there was the Report of the Committee on Managerial Decision Models, *Supplement to Accounting Review,* XLIV (1969), pp. 43–76 and An Evaluation of External Reporting Practices: A Report of the 1966–68 Committee on External Reporting, ibid., pp. 79–123.

[31] Charles T. Horngren, 'The Accounting Discipline in 1999', *Accounting Review,* XLVI (January 1971), p. 5.

[32] Accounting to them is 'the *measurement-communication function of the decision process*'. *Op. cit.,* p. 60 (emphasis contained in the original).

ical outputs from both the accounting system and the prediction models. The outputs of the decision models purport to satisfy the objective, or goal, criteria inherent in the models, and these criteria refer to observable phenomena in the observation plane; thus a link, albeit a complicated one which depends on the 'accuracy' of the inputs and outputs through three system models, is established back to the real world, and a testable proposition emerges.[33]

Certainly, despite the support for this new way of conceiving accounting science, many extremely difficult, perhaps insurmountable, problems emerge. The AAA Committee, itself, admits that:

> In fact, the complexity of the underlying process [that is involved in the specification of decision models] is so great that it is unreasonable to believe that we will ever attain a complete specification of the process, any more than our hypotheses are complete specifications of predictive relationships.[34]

C. West Churchman shows how inadequate our abstractions must really be when he discusses and dismisses the 'idealist's' conception of a decision model:

> A model, according to idealism, is supposed to represent in a part of the system the whole world of the decision maker – what we call his life, both the outer and the inner life. It must represent his dearest ambition, his politics, his love affairs, his unconscious, his death. But why stop here? An accurate model should represent besides the life of his world, his friends, enemies, ancestors, and progeny. The idealist's monism is monstrous; the model builder might as well give up.[35]

Accounting decision models must, from the outset, be seen as involving a high degree of abstraction within closely defined limits *but* also subject to empirical confirmation, either directly or more likely by quite indirect means.

In a more recent work, Churchman sees this 'basic change of attitude' in accounting producing 'a long-overdue alliance' between accounting and operations research although he warns that:

> But I think both professions will have to give up one cherished attitude – namely, the assurance of the expert. The 'model' to which I referred [which is somewhat wider than that implied by the AAA Committee] is by no means easy to create, nor can any of us feel assured that a candidate model represents social reality. No longer can we call upon the disinterested, competent observer to settle our issues. There is no 'outside' which can observe the 'inside' trying to depict reality.[36]

Already the dangers of the new emphasis are realities rather then caveats to be made by learned professors. For example, a prominent American theorist tells us

> Theory without measurement is mere speculation. . . . Measurement without theory is aimless wandering.
>
> In short, theory construction and measurement development are inseparable. The theory specifies what is to be measured, how the measurements are to be manipulated and what measurable outcomes one can expect.[37]

Even in psychology where extreme operationism has been the vogue for a considerable time now, an increasing number of psychologists would argue that such an approach robs their chosen field of much of the power that it might otherwise have to tackle the really important questions of our age. The current controversy surrounding the 'Jensen Debate'[38] on the intelligence of American blacks, for example, would seem to provide some weight to the suggestion that operationism is not without its opponents in social science. Therefore, accounting must give much closer scrutiny to the bold assertions of Professor Sterling.

Although he clearly aligns himself with the resurgence of interest in scientific accounting, Robert E. Jensen points out another grave problem which the approach must face. If accountants are to construct abstract models of various decision processes, included in the models must be propositions about the behaviour of the decision makers. Consequently, the new scientific accountants have tended to use findings produced in social science. But as Robert E. Jensen observes:

> Not only is it difficult to extrapolate from such studies, but often the studies themselves have conflicting results.[39]
>
> But this outside empirical evidence often flounders like a fish out of water when plucked from the environment in which it was generated.[40]

A similar point is made by Horngren.[41]

Jensen suggests that accountants will have to be more prepared to engage in the social science research themselves to ensure its relevance to their models. In addition, because of the unfamiliarity of the terrain, they should encourage social scientists to do research into accounting problems.

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[33] Ibid.

[34] Ibid., p. 78.

[35] C. West Churchman, *Challenge to Reason* (New York: McGraw-Hill Book Company, Inc, 1968), p. 191.

[36] C. West Churchman, 'On the Facility, Felicity and Morality of Measuring Social Change', *Accounting Review*, XLVI (January 1971) p. 34.

[37] Robert R. Sterling, 'On Theory Construction and Verification', *Accounting Review*, XLV (July 1970), p. 455.

[38] That is, the responses to Arthur R. Jensen's lengthy article 'How Much Can We Boost IQ and Scholastic Achievement?', *Harvard Educational Review* XXXIX (Winter 1969).

[39] Robert E. Jensen, 'Empirical Evidence from the Behavioral Sciences: Fish Out of Water', *Accounting Review*, XLV (July 1970), p. 503.

[40] Ibid., p. 508.

[41] Horngren, *op. cit.*, pp. 6–7.

In view of the immense difficulties a decision-oriented accountant must face, it does seem rather surprising that the AAA Committee on Foundations of Accounting Measurements talk about ' . . . the possibility of reducing, in time, *the foundations of most scientific disciplines to the foundations of more elementary disciplines*'[42] with the ultimate goal of producing the *one* 'super science'. However, the new accounting science envisaged by US academics may well prove capable of producing less ambitious, yet very valuable results.

What I wish to turn to now is its methodological presuppositions, to use a somewhat pretentious expression. One could not fail to agree that

> More attention to the requirements of good methodology should help remove some of the major obstacles in the path of theory formulation in accounting.[43]

And yet the American accounting scientists claim that their decision-oriented approach uses 'the scientific method' and consequently, by using this 'external method' can resolve the grave difficulties in making their new perspective viable. It is regrettable that they do not explain why they have such faith in 'science' and 'scientific method', or, even more basic, what they mean by these words. Such questions are by no means empty or ones on which there is general agreement. In fact, they seem to be quite unresolved.

Definitions of Science

The first problem is to look at the difficult question: what is science? It is easy to find definitions stating that science is:

(1) a systematic and structured body of knowledge
(2) concerned basically with the general, not specific cases
(3) linked with the empirical world.[44]

However, do such definitions really provide a clear basis for distinguishing science from non-science? Most of what is said is not unique to empirical science. It could be argued, for example, that philosophy and mathematics could fit within these definitions also; yet they are non-empirical sciences. There is, however, one characteristic which is not applicable to these non-empirical disciplines. This is the point made by Rigby[45] that the theoretical knowledge in science explains the data observed. Without this link empirical observations form a meaningless array.

> The ideal of science is to achieve a systematic interconnection of facts. Isolated propositions do not constitute a science. Such propositions serve merely as an opportunity to find the logical connection between them and other propositions.[46]

This characteristic, the link between theory and observation, seems to be important and it is contained in many definitions. For example:

> A *science* is a body of systematised knowledge. Such knowledge is gathered by carefully observing and measuring events, sometimes, but not necessarily, in experiments set up by the scientist to produce the events he is studying. The things and events observed are systematised in various ways, but principally by classifying them into categories and establishing general laws or principles that describe and predict them as accurately as possible.[47]

Essence of Science: Content or Method

An area of controversy is whether subject matter or method or both are necessary to isolate a field as science. Those who argue that content distinguishes a study as scientific imply that there are certain areas of knowledge which can never be examined scientifically. In other words they must introduce some notion of the 'limitations of science'. However, it seems reasonable to point out that:

> We need not concern ourselves with whether or not such a limit exists, since it is clear that until it is well defined and generally accepted, it cannot be used to distinguish between scientific and non-scientific inquiry.[48]

If some doubt is cast on the importance of the subject matter, then the social/natural science dichotomy may be untenable. It seems that the anti-naturalistic view has little popularity today. To Rudner it is insupportable to maintain:

> . . . either that social sciences must fail to achieve the methodological objectivity of the rest of science

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[42] Report on Foundations of Accounting Measurements, *op. cit.*, p. 48 (emphasis is contained in the original).

[43] John W. Buckley, Paul Kircher and Russell L. Mathews, 'Methodology in Accounting Theory', *Accounting Review*, XLIII (April 1968), p. 283.

[44] Refer to Morris R. Cohen & Ernest Nagel, *An Introduction to Logic and Scientific Method* (London: Routledge & Kegan Paul Ltd, 1934), p. 191; Paul H. Rigby, *Conceptual Foundations of Business Research* (New York: John Wiley & Sons, Inc, 1965), p. 1; Bertrand Russell, *The Scientific Outlook* (2nd ed, London: George Allen & Unwin Ltd, 1949) p. 10.

[45] Rigby, *op. cit.*, p. 1.

[46] Cohen and Nagel, *op. cit.*, p. 394.

[47] Clifford T. Morgan and Richard A. King, *Introduction to Psychology* (3rd ed.; New York: McGraw-Hill Book Company, Inc, 1966), p. 4.

[48] Russell L. Ackoff, *Scientific Method: Optimizing Applied Research Decisions* (New York: John Wiley & Sons, Inc, 1962), pp. 2-3.

> [that is, 'natural' science] or that social science must employ a radically different methodology.[49]

As these are the principal grounds for splitting science in this way, Rudner rejects the dichotomy and takes a naturalistic position.

To argue that method in science need not be basically different is important because if the method is similar it may be possible to identify science by examining its methodology. Therefore, Rudner's basic argument is presented in more detail:

> The method of science *is*, indeed the rationale on which it bases its acceptance or rejection of hypotheses or theories. Accordingly, to hold that the social sciences are methodologically distinct from the non-social sciences is to hold not merely (or perhaps not at all) the banal view that the social sciences employ different techniques of inquiry, but rather the startling view that the social sciences require a different logic of inquiry. To hold to such a view, moreover, is to deny that all science is characterised by a common logic of justification in its acceptance or rejection of hypotheses or theories.[50]

Rudner's case is clearly quite compelling. To reject it one would have to support the ridiculous view that two logics exist in science. The accountant, R. J. Chambers, also argues for and accepts the naturalistic viewpoint.[51]

However, few accounting writers have examined the importance of the method of science as a basic criterion for identifying science. Goldberg is an exception. He looks specifically at this question and he argues that:

> . . . a science comprises not merely scientific knowledge, but, in addition, scientific method . . . unless an exposition actually proves its conclusions by logic or experiment and avoids unsupported assertions, even though they be of fact, it cannot be regarded as scientific.[52]

From this Goldberg then reaches the conclusion that the scientific method is, in fact, the basic feature of science. '*It is the application of the scientific method which is the essence of a science.*'[53] This conclusion is shared by many other writers[54] as well:

> The unity of all science consists alone in its *method*, not in its material.[55]
>
> . . . when we speak of accounting or business administration as a science, we are referring to its *method*, as most readers are undoubtedly aware.[56]

Other Identifying Criteria of Science

In the previous section an attempt was made to look for the essential condition of science. 'The scientific method' was advanced as the basic test. However, the task of clarifying the nature of science is not complete. Other characteristics of science are presented in the literature and to uncover the conditions both necessary and sufficient to scientific inquiry, some of these must be briefly examined.

Wolf says the following about the conditions of science:

> These sciences have certain characteristics in common which differentiate them from other departments of knowledge. The common characteristics of science properly so called may be enumerated as follows:
>
> (*a*) Critical discrimination;
> (*b*) Generality and system;
> (*c*) Empirical verification.[57]

Critical discrimination refers to the attitude the scientist should adopt in his work. It may be viewed as

> . . . a driving curiosity, reasonable scepticism, desire for conclusiveness with a willingness to revise as necessary, conscious avoidance of mental bias, alertness to error, awareness of limitations, and a tendency toward systematic generalisation.[58]

Clearly this attitude, being shared by the mathematician and the philosopher as well, is not sufficient to establish a science. However, the attitude of the independent, 'objective' person is often seen as essential to an understanding of 'scientific method' and, therefore, it must be noted.

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[49] Richard S. Rudner, *Philosophy of Social Science* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc, 1966), p. 65.

[50] Ibid., p. 5.

[51] Raymond J. Chambers, *op. cit.*, pp. 12–14. These views are reiterated in his article 'The Conditions of Research in Accounting', *Journal of Accountancy*, CX (December 1960), p. 35. Similarly, the pure/applied split which is so often made is of little help in isolating the necessary conditions of science. The split is an historical one and the two categories by no means are mutually exclusive.

[52] Louis Goldberg, *A Philosophy of Accounting* (2nd ed.; Melbourne: Accountants Publishing Company Limited, 1947), p. 35.

[53] Ibid. (emphasis added).

[54] See Clarence W. Brown & Edwin E. Ghiselli, *Scientific Method in Psychology* (New York: McGraw-Hill Book Company, Inc, 1955), pp. 4–6; Cohen & Nagel, *op. cit.*, pp. 190–193; William J. Goode and Paul K. Hatt, *Methods in Social Research* (New York: McGraw-Hill Book Company Inc, 1952), pp. 7–8; Thomas R. Prince, *Extension of the Boundaries of Accounting Theory* (Cincinnati: South-Western Publishing Co, 1963), pp. 13–22; Pendleton Herring, 'Towards an Understanding of Man', in *New Viewpoints in the Social Sciences*, ed. by Roy A. Price (Twenty-Eighth Yearbook of the National Council for the Social Studies; New York: National Council of the Social Studies, 1958), pp. 4–5.

[55] Karl Pearson, *The Grammar of Science* (London: J. M. Dent and Sons Ltd, 1937), p. 16 (emphasis added).

[56] Milton H. Spencer, *op. cit.*, p. 310.

[57] A. Wolf, *Essentials of Scientific Method* (2nd ed.; London: George Allen & Unwin Ltd, 1928), p. 11.

[58] R. K. Mautz and Hussein A. Sharaf, *The Philosophy of Auditing*, American Accounting Association Monograph No. 6 (Columbus, Ohio: American Accounting Association, 1961), p. 20.

The generality condition is one which is usually insisted upon. The following statement is common: 'Science though it starts from observation of the particular is not concerned essentially with the particular but with the general.'[59]

The reference to 'system' is important. What is meant is that all the concepts, hypotheses, theories, and so on, of a particular field of study must be interrelated and built into a unified, hierarchical pattern or system of knowledge. The significance of this characteristic is to develop clarity and understandability in the theoretical structure and also so any incompatibilities can be easily recognised.

Mathematics, for example, is a perfect case of a hierarchical system with the highest possible degree of generality. As mathematics is a non-empirical 'science' neither generality nor system differentiates the empirical science from other forms of discourse.

Universal Agreement and Immutable Truths

Few *today* will argue that 'universal agreement' is necessary or even possible. A notable exception is Campbell who only a few years ago claimed that this was a necessary and sufficient condition of science. 'Science is the study of those judgements concerning which universal agreement can be obtained.'[60]

The universal agreement criterion seems difficult to defend. Yet Campbell believed that he could successfully answer all the important criticisms levelled at this approach:

> Various objections to this view are considered: (1) There are differences of opinion in science as in other studies. Agreed; but they do not concern *fundamentals*. (2) A single bold denier could upset all science. No; he could not maintain his denial; here science is distinguished from mathematics. (3) What of 'abnormal sensations', e.g. colour blindness? Judgements of colour are not *fundamental*; . . . (4) If this answer is accepted, are there any universally admitted judgements left? Yes; *fundamentals* of 'time', 'space', 'number', 'identity', and perhaps others.[61]

It will be noticed that Campbell repeatedly used the term, fundamental. In fact, the major arguments against his definition of science set out above are avoided by an appeal to some vague notion of 'fundamentals'. Campbell was a leading exponent of the so-called Fundamentalist School in philosophy which was quite popular in the first half of this century. Everything, he would claim, can be reduced by a process of 'regression' (assumed to be finite) to fundamental states.

This approach is largely disregarded today.[62] Campbell places no emphasis on method or approach but only on the thoroughly discredited idea of reduction to 'fundamentals'. Campbell's 'fundamentals' are virtually the same view of science as the claim quite popular in pre-Einstein days that science consisted of a series of immutable truths. Since this time comprehensive studies have been conducted into the nature of scientific theories and most people accept the view that *all* conclusions are tentative.[63] These conclusions, when tested, are either falsified by the evidence or are regarded as *not yet falsified* and consequently they are accepted for the moment.

The conclusion, therefore, must be that neither the universal agreement criterion nor the allied idea of viewing scientific conclusions as unchanging truths can be accepted in the attempt which is being made to characterise science.

Quantifiability

There seems little doubt that measurement is often an extremely useful tool to the scientist. There is no real need to extol the virtues of measurement here. However, could it really be said that it is not only a popular tool of science but, in fact, a distinguishing characteristic of science? Morgan and King promote this view:

> Another distinguishing feature of science is *measurement*. Almost all of us take it for granted that each science measures things. We rank highest among the sciences the one that has developed the most precise measurements. For this reason, physics is usually credited with being the most 'scientific' of the sciences because its measurements are so precise.[64]

These ideas seem in line with the notion of talking of the 'exact' sciences. The term is clearly a misnomer. All it can really mean is that such sciences can measure the *errors* involved in research (using probability techniques).

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[59] Russell, *op. cit.*, p. 57.

[60] Norman Robert Campbell, *What is Science?* (New York: Dover Publications, Inc, 1952), p. 27.

[61] Norman Robert Campbell, *Foundations of Science: The Philosophy of Theory and Experiment* (New York: Dover Publications, Inc, 1957), p. 15 (emphasis added). This work was formerly titled and is probably better known as *Physics: The Elements.*

[62] See, for example, Ackoff, *op. cit.*, pp. 195–201, and C. West Churchman, 'A Materialist Theory of Measurement', in *Philosophy for the Future*, ed. by R. W. Sellars, V. J. McGill, and M. Farber (New York: The Macmillan Company, 1949), pp. 476–94 for a telling criticism of Campbell's basic concept, 'fundamental measurement'. Campbell, himself, discusses this idea fully in *Foundations of Science*, pp. 267–94.

[63] See Karl R. Popper, *The Logic of Scientific Discovery* (London: Hutchinson & Co (Publishers) Ltd, 1959).

[64] Morgan and King, *op. cit.*, p. 14.

It would be a bold person who saw quantification as a necessary condition of science. To do so he would depreciate such significant works as Darwin's 'Theory of Evolution' which was wholly qualitative in nature. Therefore, it seems that measurement may well be a characteristic in many sciences and yet it is not necessary or sufficient.

Lawfulness

> The basic postulate of all science states that nature is, to *some degree*, predictable; this postulate is merely an inductive inference based on man's experience. He has found that attempts to predict have been successful enough to be useful in the struggle for survival. The postulate merely serves notice that man expects to continue the effort to make predictions as long as they are useful to him.[65]

Most scientists approach their research with some vague notions about the predictability of nature. Walker's views seem a reasonable statement of the general idea behind the postulate and the reason for making it. Even if scientists assume 'some degree' of predictability, it is clear that the ability to predict can vary with the phenomena under review. For this reason predictability cannot be, in itself, the criterion for identifying science. However, it is an important characteristic in most of the sciences.

Many writers seem to over-emphasise the role of prediction in science. To them a science must not only be able to predict future events but it must be able to predict them in an extremely precise fashion. Schireson expresses this view: 'If accounting were a science, the practitioners would be expected to prognosticate within a definite range of accuracy.'[66]

The basis for this attitude is not apparent. Lawfulness or predictability makes an area suitable for scientific study. The investigations are likely to be more fruitful. But lawfulness does not make an area a scientific study. It seems fairly clear that although predictability will often have a place in the various sciences, the nature of this place is too uncertain for it to be a major identifying characteristic of science. Nagel agrees that predictability varies in its significance: 'It needs little argument to show that the circumstances which permit long-range predictions in astronomy do not prevail in other branches of natural science...'[67]

Conclusion

If this discussion has done nothing else surely it does support the contention that there is no universally accepted concept of science even though the question: 'what is science?' has occupied philosophers of science probably more than any other single question. The view of Russell Ackoff is also easy to accept:

> History is 'on the side of' an expanding domain of science. One by one the curtains separating science from various aspects of reality have been opened. In the ideal one might suspect that all problems will be susceptible to scientific study. At least there is no good reason to suppose a limit to the expansion of the domain of problems to which science can be applied.[68]

Science as a different mode of discourse from non-science

The established sciences have become so important in society, their findings have contributed so much to our advancement – or so it is popularly believed – that few seem to look specifically at the question of whether the benefits of becoming a science are sufficient to warrant its use. Many of the authors in the literature are themselves practising scientists and, consequently, they tend to be so imbued with the virtue of science that their lack of concern with the question might tend to imply their belief that the question is quite superfluous or even frivolous. Perhaps the real reason is that this question is extremely difficult to answer. As Stigler says: '... without attempting to depreciate science in general, it is worth mentioning that the grounds for the prestige of science are nebulous.'[69]

The reason usually advanced for the prestige science undoubtedly enjoys is that science employs all the elements common with other knowledge but with much greater rigour. The difference is essentially one of degree, therefore, it is argued that science is *likely* to produce '... the *most exact, most carefully verified*, and *most general knowledge* available to man'.[70] Consequently, it seems worth asking whether science does in fact represent a qualitatively different method of reasoning and supporting propositions from non-science. If not, then one *might* be able to conclude that the difference between scientific explanation and 'common sense' explanation is not really worth making!

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[65] Marshall Walker, *The Nature of Scientific Thought* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc 1963), p. 70 (emphasis added).

[66] Bert Schireson, 'Towards a New Accounting', *Accounting Review*, XXXII (April 1957), p. 256.

[67] Ernest Nagel, 'Problems of Concept and Theory Formation in the Social Sciences', in *Philosophy of the Social Sciences: A Reader*, ed. by Maurice Natanson (New York: Random House, Inc, 1963), p. 207.

[68] Ackoff, *op. cit.*, p. 443.

[69] George Stigler, *The Theory of Price* (New York: The Macmillan Company, 1949), p. 3.

[70] Herbert L. Searles, *Logic and Scientific Method* (2nd ed.; New York: The Ronald Press Company, 1956), p. 205 (emphasis contained in the original).

As we have shown here, that not only does all science employ the same broad 'method' but also as there are no areas into which the intrusion of science is not possible, it could be argued that this rather unconventional conclusion is at least *plausible.* I would tend to modify this view somewhat before finding it acceptable. One could however argue that *the* so-called 'scientific method' is in reality an extremely abstract, nebulous idea. It seems to encompass a multitude of different techniques, procedures, and objectives. The important consideration in science seems to be: does the new technique work? does it provide a solution to a particular research problem? Whether the technique is part of this 'scientific method' is usually considered an uninteresting question to the practising scientist. In addition, a scientist starting out with a research problem will gain little or no help by reading about what philosophers of science have written on 'the scientific method'. Consequently, it might be argued that the principal objective of science is to carry-out creative work and solve problems. It has no formulas and not even a *general* approach on which practitioners can rely in their work.

This argument has some merit but it misses one important point. Science is involved with both the generation of possible explanation (the discovery or hypothesis stage) and the validation of these hypotheses. The distinction is blurred in the above argument.

Helmer and Rescher present in the following quotation what is probably the dominant view which shows the considerable importance of this distinction:

> What matters is not whether or to what extent inexactitudes in procedures and predictive capability can be removed [in social science research]; rather it is objectivity, i.e. the intersubjectivity of findings independent of any one person's intuitive judgement, which distinguishes science from intuitive guesswork however brilliant. This has nothing to do with the intuitive spark which may be the origin of a new discovery; pure mathematics, whose formal exactness is beyond question, needs that as much as any science. *But once a new fact or a new idea has been conjectured, no matter on how intuitive a foundation, it must be capable of objective test and confirmation by anyone.* And it is this crucial standard of scientific objectivity rather than any purported criterion of exactitude to which the social sciences must conform.[71]

Acceptance of such a position would restrict 'the scientific method' to the area of validation only. In the crucial area of discovery, science/non-science distinctions are clearly of no importance.

Of course, it is still an open question whether 'the scientific method' as a validation technique is *qualitatively* different from validation in non-science. One could still question '*the* scientific method' as *the* validation procedure and suggest that an almost infinite range of specific validation procedures seem likely to exist and that some, at least, may be exactly the same as those used in the validation of 'common sense' views. Also one could raise the difficulty of deciding exactly whether a specific technique falls under the mantle of 'scientific objectivity'. This suggests that there is a need for a study of the notions of 'scientific objectivity' in the literature of philosophy of science. None of this has seemed worth looking into by the American theorists.

However, such an examination is not needed to establish the conclusion that if it is in the area of innovation and creative thinking that accountants need their 'revolution', then quite clearly use of the labels, 'science' and 'the scientific method' will be to no avail. Thus, US accounting science of the 1970s seems *in itself* to offer nothing in terms of a major advance in accounting. And yet reading a considerable number of articles in the *Accounting Review*, one seems to take away the clear implication that accountancy is on the brink of substantial change. The new emphasis on the decision making process *may* prove useful, particularly if highly abstract, very general models are not hoped for. But accounting as a science and accounting concerned with understanding decision making are two distinct perspectives. There is no necessary reason to join them. That is, the new emphasis on decision making is possible without labelling accounting a science.

Additionally, if we are concerned with studying actual decision processes, accounting *must* have an empirical aspect, irrespective of whether the title 'scientific' is accepted or rejected. 'The scientific method' also provides no fixed steps in the area of validation and neither does it establish propositions as 'true' (thus ending debate for all time). The existence of competing hypotheses for lengthy periods is still a possibility, hopefully not to the same degree as in current accounting theory.

Conclusion

It is, I believe, in the area of discovery that the major breakthroughs in accounting (or any other discipline) will occur. Here science does not give us any better answers than any other mode of discourse.

It is in the validation of propositions that the AAA and a number of individual American theorists hope to see the benefits of science. But strangely they have not inquired into the nature of scientific discourse – in particular, how a scientific explanation differs and is 'better' than a non-scientific one, what is the meaning of 'the scientific method' and whether it provides clear guidelines upon which to base an accept/reject decision on hypotheses generated by researchers. These would all seem to be critical areas. Exactly what 'science' means is still unclear in philosophy of science. And yet, *many American academics proceed as though these questions had been satisfactorily resolved and resolved in such a way as to make talk about creating accounting science an important advance in itself.*

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[71] Olaf Helmer and Nicholas Rescher, 'On the Epistemology of the Inexact Sciences', *Management Science*, VI (October 1959), p. 27 (emphasis added).

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Financial Management in the Soviet Industrial Enterprise

K. T. Maunders

Twelve years ago R. W. Campbell set out 'to inquire into the relationship between Soviet accounting and the economic problem of rational choice among alternatives'.[1] The relatively fundamental changes which appear to have taken place in the Soviet system since that time provide an excuse for another look at the role of accounting in the Soviet economy, and in particular at its effects on financial decision making at the enterprise level.

I feel that much of the practice of Soviet financial management is understandable only in the institutional context in which it takes place and therefore begin below by giving a brief review of the present institutional set up. I follow this with a resumé and comment on some of the important changes brought about by the post-1965 reforms insofar as they affect financial management, and conclude with an examination of the possible effects of Soviet accounting practices on some areas of financial decision making. The classic reference work in this area remains Campbell's own book[2] which was, however, written in 1962, i.e. before the reform era. Horwitz's research study[3] provides an excellent survey of post-1965 developments but in view of the degree of flux in the Soviet system, an updating of even this latter appears necessary in certain areas. At this point, however, it is necessary to repeat Campbell's caveat on the difficulties of obtaining direct evidence on the practice of financial management in the Soviet enterprise. For this reason alone, the present article is, in its turn, perhaps bound to raise more queries than it answers.

The background to Soviet financial management

The Soviet system has been characterised as a 'command' economy operating through a giant 'monocorporation' – the Soviet state. The national allocation of resources, pattern of production and distribution of income are all subject to an explicit planning mechanism responsible to the highest levels of political authority. The overall State plan is both an authorisation and command instrument administered by the State Planning Committee (Gosplan) and handed down through a series of hierarchical levels (Ministries, etc.) to the production units.

Industrial production is carried out in 'enterprises', which have many of the features of capitalist firms. A decree issued in 1965 defines the role of the Soviet enterprise as follows:

'The Socialist state production enterprise using the state property legalised for its administration and disposal and relying on hired manpower under the guidance of the above administrative body executes the economic activity . . . in accordance with the national plan targets on the basis of the self-accounting principle. The enterprise carries out all the obligations and enjoys rights related to the mentioned activity, makes up its own balance and possesses legal rights.'[4]

Ultimate executive responsibility in the Soviet enterprise rests in a single chief executive or 'director', who is fully responsible to the state for the activities of the enterprise. All residual rights in the enterprise are due to the State, which occupies the role of the equity shareholders in a Western firm. Below chief executive level, organisation charts usually show a functional division of responsibilities.[5, 6] One difficulty spotlighted by an examination of such charts is that of identifying the role players in financial management of the enterprise. Although there is an executive called the 'Chief Accountant' responsible directly to the director, further inquiry quickly shows that his responsibilities are not so widely drawn as those of the Chief Accountant, or Controller, of a Western firm. In fact, in a Russian enterprise the accounting department proper is basically concerned with recording and reporting actual performance. Preparation of plans, forecasts, budgets, etc. is normally carried out by the Economic Planning Department under a Chief Economist, also responsible directly to the director. The Chief Economist will often be trained in accounting as well as economics, statistics, etc. and as such may be well fitted to supervise one of the functions of his department – preparing reports for special decision making situations, such as capital investment proposals.

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[1] R. W. Campbell, 'Soviet Accounting and Economic Decisions', reprinted in W. T. Baxter/S. Davidson, *Studies in Accounting Theory* (London: 1962) p. 356.

[2] R. W. Campbell, *Accounting in Soviet Planning and Management* (Cambridge, Mass.: 1963).

[3] B. Horwitz, *Accounting Controls and the Soviet Economic Reforms of 1966* (Evanston, Illinois: 1970).

[4] Quoted in: D. Allachverdjan, 'Planning and Management of Enterprises and Firms in the USSR', reprinted in J. T. Dunlop/N. P. Fedorenko, *Planning and Markets* (New York: 1969) p. 161.

[5] B. M. Richman, *Soviet Management* (Englewood Cliffs: 1965) pp. 60–1.

[6] B. Horwitz, *op. cit.*, pp. 6–7.

The span of responsibility of the Chief Accountant compared with his Western counterpart is restricted in a further way. Because of the crucial importance of enterprise accounting results in the national planning mechanism, Soviet accounting practices are characterised by a high degree of uniformity and standardisation. The institutional structure of accounting administration above the enterprise level has been concisely described as follows:

'The Department of Accounting and Statements of the Ministry of Finance prescribe in general the accounting and reporting to be used by enterprises, and the Central Statistics Administration guides the installation of the originating documentation and computers for the enterprises. The Ministry of Finance has a Methodological Council on Accounting which periodically discusses different questions for developing the uniform accounting system. Within each industrial Ministry, an accounting department directs the particular accounting procedures for those enterprises within the Ministry.'[7]

This obvious circumscription of the accounting departments' work does not, however, necessarily imply a corresponding reduction in the status of the Chief Accountant. The reasons for this are twofold. Firstly, the Chief Accountant has responsibility for preparing, and submitting to higher authorities, the performance reports by which the enterprise managers will be judged. Even with a high degree of standardisation of accounting practice, there is still, necessarily, room for discretion in such reporting. Secondly, the legal position of the Chief Accountant places him in a situation *vis-à-vis* the director which has been compared to that of an internal auditor *vis-à-vis* internal managers in the Western firm.[8] According to a decision taken at the highest state level, the Chief Accountant is appointed by and directly responsible to the ministry, or other higher organisation, for the maintenance of the prescribed accounting rules within the enterprise. He is entitled to receive copies of all orders and directions of higher administration and is required to authorise the signing of all documents relating to money and material expenses. He is thus, to some extent, theoretically independent of the director's authority, but in practice remains subject to his instructions through his general duty to provide financial information which will aid the director in achieving the goals of the enterprise.

Economic reforms

Prior to the major reforms of 1965, the production activities of industrial enterprises appear, in general, to have been very tightly controlled through the state planning hierarchy. Inputs were strictly rationed to accord with the 'norms' implied in the enterprise's production plan, which was in turn strictly defined in terms of types and quantities of output. The prices of both inputs and outputs were centrally controlled. Aggregate payments to labour were fixed by the planned 'wage fund'.

Allocation of investment funds to enterprises was centrally determined so as to accord with national objectives with respect to the balance of aggregate consumption and investment and the, politically determined, preferred directions of growth of the economy.

The national strategy for growth which, in fact, dominated the Soviet planning system for over 30 years, up to 1965, has been aptly labelled 'conspicuous production'.[9] Its objectives appear to have been primarily political – to 'bury the capitalists'. In retrospect, however, it must be admitted to have been remarkably successful in its main economic aim – to reach a high level of Gross National Product in the shortest possible time. Various writers have warned of the noncomparability of the Soviets' own statistics on growth and output but even the most rigorous adjustment of these to fit Western definitions reveals a remarkable level of achievement.[10] The 'tight' system of state planning briefly outlined above must inevitably be given considerable credit for this achievement.

The very success of this tightly controlled planning system brought problems, however. Much of the national growth over the period took the form of increases in the output of heavy industry, towards which a large proportion of investment funds had been directed. When the point was reached at which it became politically desirable to deal with the obvious imbalances in the economy created by this policy, rates of growth of the magnitude previously obtained proved harder to sustain. In the early 1960s the growth in GNP seems to have fallen to around half that of previous years. Amongst factors contributing to this fall, limitations in the traditional tight planning mechanism must be ranked high. It seems, in fact, as if the switch to 'intensive' as opposed to 'extensive' directions of economic development exposed inherent weaknesses in the control and decision making procedures implied in the traditional planning system. Dobb suggests the form taken by some of these weaknesses in the following quotation:

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[7] N. G. Chumachenko/N. M. Bedford, 'Some Distinctive Aspects of Accounting in the USSR', *International Journal of Accounting*, Vol. 4, No. 1, Fall 1968, p. 30.

[8] B. Horwitz, *op. cit.*, p. 9.

[9] M. Polanyi, 'Towards a Theory of Conspicuous Production', *Soviet Survey*, No. 34, October–December 1960, p. 96.

[10] R. W. Campbell, *Soviet Economic Power* (London: 1967) ch. 6.

'... the autonomy of the individual enterprise was increasingly fettered by the piling on of administrative directives and plan targets of increasing detail and complexity. There was often a great deal of what Professor Liberman has since called 'petty tutelage' over the enterprise, fettering its discretion and initiative, and decisions on so-called "microscopic" questions were taken by higher authorities that were ill-equipped in information or prescience to handle them.'[11]

Two separate problem areas seem, in fact, to be identifiable from this quotation:

(*a*) information processing – the increasing difficulty of communicating all the relevant data to centralised decision makers if they are to make rational choices on behalf of each enterprise in an increasingly complex economy.

(*b*) motivational – that centralised decision making may stifle initiative and actually depress performance at the enterprise level even if the information processing problem is overcome, e.g. by the extensive use of automatic data processing.

These problem areas will probably be immediately recognisable to readers familiar with the extensive literature on the growth of the business organisation in the West. The classic solution here has been to restructure responsibilities in the direction of decentralisation of control and decision making.

The theoretical advantages of such a solution apparently appealed also in the Soviet context, for a meeting of the Central Committee of the CPSU in September 1965 adopted proposals for economic reform put forward by A. Kosygin along lines which introduced a, strictly controlled, element of decentralisation into the planning mechanism.

To the Western observer, however, the resulting 'freedom' of enterprise management may still appear to be formidably constrained:

'For industrial enterprises the following targets and indices retain their directive character:

(1) volume of output sold
(2) targets for the major nomenclature of goods
(3) volume of centralised capital investment
(4) commissioning of productive capacity and assets built with centralised investments
(5) targets for the development and introduction of new technology (manufacture of new models, introduction of new manufacturing processes, mechanisation and automation, etc)
(6) assignments for the delivery of raw materials and other supplies and equipment
(7) wages fund
(8) profits (volume and level of profitability)
(9) indices of relations with the budget.'

In the next line, the same source adds, with unintentional irony:

'All other indices of economic activity will be planned by enterprises independently.'[12]

From a financial management point of view, perhaps the most important change was that in the indices by which enterprise performance was to be judged. Prior to the reforms these were primarily based on gross output targets, although on the assumption that these targets were in fact met, incentive schemes were sometimes geared to achieving cost reductions. The reforms changed the most significant indicators of efficiency from gross output and cost reductions to sales volume, profit and profitability measures.

The switch from gross output (production) to sales volume was an interesting move in itself, designed to deal with some well documented problems of Soviet demand management. Concentration on gross output as an indicator of achievement, in conjunction with a basically non market based pricing system led, *inter alia*, to build-ups of unwanted inventories, inadequate quality control and a disincentive to product development. A revision of the wholesale pricing system was, in fact, begun in 1966, with reference to which one Soviet source writes:

'It will be a most essential prerequisite of the new reform because if prices are not made realistic economic calculations lose their dependability, which in turn encourages the adoption of subjectivist decisions. Without this, the loss and profit accounting system and economic incentives could not be really effectively applied.'[13]

The system of price setting in a Socialist economy is clearly of direct relevance to financial decision making, as this quotation indicates. Its theoretical background is beyond the scope of this article, but it may be commented here that in the absence of an actual free market economy it may be doubted whether prices can be made to consistently reflect opportunity costs, whatever the sophistication of the market simulation mechanism proposed.

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[11] M. Dobb, Introductory Note, in M. Bor, *Aims and Methods of Soviet Planning* (London: 1967) p. 13.

[12] M. Bor, *op. cit.*, pp. 32–33.

[13] V. P. Gloushkov, 'New Methods of Economic Management in the USSR: Some Features of the Recent Economic Reform', reprinted in J. Margolis/H. Guitton, *Public Economics* (London: 1969) p. 354.

Other important changes introduced by the 1965 reforms, and referred to in greater detail below were:

(*a*) the introduction of a charge for capital

(*b*) the partial decentralisation of investment decisions

(*c*) the introduction of employee incentive schemes based, inter alia, on profitability of operations

(*d*) the suggested use of a charge for the differential resource benefits enjoyed by enterprises, in the form of an 'economic rent'.

The above reforms were at first implemented on only a pilot study scale, from which the results appear to have been greatly encouraging.[14] Since 1967 there has been a gradual extension of their coverage, so that by 1970 83 per cent in number of industrial enterprises, covering 93 per cent of total output, had been included.[15]

On the basis of these statistics it now seems reasonable to use the reform measures as a model for comment on enterprise financial management in the USSR. Before proceeding to do so, however, it is necessary to point out that the reform measures as described above (and below in more detail) appear to be still regarded as somewhat experimental and are subject to practically continuous detailed revision in their administration. I have, therefore, attempted only to summarise my views of the latest official position as indicated by available English language publications and translations, and would not wish to imply that this is necessarily a completely up to date reflection of practice.

Financial decision making

In this section I want to examine some distinctive aspects of financial management in the Soviet enterprise, under the following heads:

(*a*) Financial reporting

(*b*) Planning and control of routine operations

(*c*) Investment appraisal

(*d*) Other special decision situations

(*a*) Financial reporting

Superficially the preparation of external financial reports by Soviet enterprises appears very similar to its equivalent in Western firms, except that many more of the subsidiary documents must be submitted to the 'shareholders':

'An annual accounting report consists of a balance sheet, footnote references to it, statements about changes in the State fund, statements, concerning kindergartens and children's homes, references to assignments of incentive funds, statements of production expenses, costs of production, overhead amounts, production output, quantities of workers and employees and the funds used for wages and salaries, the use of incentive funds, the movement of fixed assets, sales and distribution costs, profits and losses, and the use of buildings and municipal community property . . . All of the statements and reports are sent by the enterprise to the corresponding industrial Ministry, and the local division of the State Bank.'[16]

A knowledge of accounting theory leads us to ask just how relevant all this statutory information can be to its users. Rather than attempt a long and rigorous examination of this question, I confine myself here to considering a particular area of use which seems to be crucially important in the Soviet context – the system by which congruence between the State objectives and those of enterprise management is encouraged, i.e. the use of financial reporting in the incentive system.

One effect of the economic reforms was to introduce an incentive scheme for management which geared their remuneration to two financial indicators – enterprise profitability and rate of growth (of profits or sales). This scheme thus gives direct relevance to the measurement of profitability in the Soviet enterprise.

'Profitability' is, as in the West, a ratio of a measure of income (profits) to a measure of assets.

The measure of profits used for incentive payment purposes is so called 'accounting profit' (*raschetnaia pribyl*). The computation of such accounting profits differs significantly from Western practice, *inter alia*, with respect to the following items:

(1) The charge for depreciation

Depreciation rates are fixed by the central authorities according to the nature of the asset. The straight line method is apparently always used because of its Marxist connotations.[17] The most significant feature of the Soviet depreciation charge is that it is set so as to cover not only the original cost of the asset but also the expected amount to be spent on 'capital repairs'[18] over the life of the asset. Actual amounts spent on capital repairs are then debited to reduce the depreciation provision as they arise.

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[14] G. R. Feiwel, *The Soviet Quest for Economic Efficiency* (New York: 1967) pp. 308–14.

[15] *ABSEES*, July 1971, p. 118.

[16] N. G. Chumachenko/N. M. Bedford, *op. cit.*, p. 31.

[17] B. Horwitz, *op. cit.*, p. 20.

[18] Horwitz describes a capital repair as 'a correction or change of a basic part of the repaired asset that is connected with the extension of the life of the asset', *op. cit.*, p. 14.

In practice, with actual capital repair expenditures being incurred at current (higher than historical cost?) prices, the effect may be to increase reported income and net asset valuations as compared to their Western equivalents. A further bias in this direction may result from the setting of too low rates of depreciation by central authorities.[19]

(2) Allocations of current costs

Standardization of accounting practice extends to the cost accounting sphere:

> 'The fundamentals of cost accounting for industrial enterprises are set forth in the general regulations for planning, accounting, and calculations of costs for industrial enterprises, which is approved by the State Planning Committee, the Central Statistical Administration, and the Ministry of Finance. Industrial Ministries prepare their branches regulations which reflect the particular features of their corresponding branch. Very large enterprises, as a rule, prepare their own detailed instructions and rules.'[20]

The major difference between Western and Russian practice in this area seems to be a tendency in the latter to accumulate costs under more aggregative headings, and thus apply a less selective approach to the allocation problem. Methods of overhead allocation vary as in the West, no longer being confined by doctrine to direct labour cost, as was apparently the case at an earlier date.[21]

(3) The charge for the use of assets

This was a novel feature of financial reporting introduced by the economic reforms for the apparent purpose of reducing the propensity of management to hoard unused assets.[22] The charge is calculated as a percentage of the sum of gross fixed assets (before depreciation) and planned working capital. The rate used seems to be variable, figures between 2·5 per cent and 10 per cent being noted for different enterprises, depending on their level of profitability.[23] The amount of this charge is actually remitted to the State.

(4) The charge for economic rent

This is a lump sum charge, again to be remitted to the State, intended to 'cream off' any supernormal profits obtained by an enterprise through exceptional advantages not connected with management's current performance. Such advantages might take the form of artificially high output prices, locational advantages or exceptionally low prices for inputs. It is worth noting in this context that land and other natural resources in the Soviet Union cannot be sold and thus have no input costs recorded in either the balance sheet or income statement. The effect of such unrecorded differences in operating conditions of enterprises would be to distort the comparability of performance measures and the incentive scheme which derives from them. To rectify this, the charge for economic rent is supposed to be set at a level which removes such distortions. To fix such a charge, however, one needs in effect to make an assumption of independence between supernormal profits and managerial efficiency – otherwise one would be 'throwing out the baby with the bathwater'. But such an independence does not appear to be a reasonable assumption to make in practice.[24]

Accounting profit, in the Soviet context, is thus arrived at after charging the usual Western expenses, plus assets charge and economic rent. Book losses on fixed assets are now also charged to accounting profits.

The asset base used for profitability calculations is gross fixed assets plus planned working capital. The chief reason for using a fixed asset measure gross of depreciation seems to be to encourage enterprise managers to replace worn out assets. If a net assets measure was used, *ceteris paribus*, recorded profitability would increase with increasing average age of assets, and incentive bonuses would increase correspondingly.

Fixed assets are normally valued on an original cost basis, subject to infrequent nation-wide revaluations on a replacement cost basis, the most recent of which was intended to take effect on 1.1.72. Current assets are valued in accordance with price lists prepared by each industrial ministry.

Taking, as we have done, the above measurements of profit and profitability to be intended as indicators of managerial efficiency in an economic sense, their relevance will be governed critically, in practice, by the administrative rules used to fix economic rents, capital charges, depreciation rates, etc. If these rules could be operated so as to take into account economic sacrifice, then there is no reason to suppose that the Russian measurements would give any worse indication of efficiency than corresponding Western ones. Indeed, the flexibility of the Soviet system provides a potential method of taking into account externalities and imputed costs which may be absent from Western calculations. However, there is a good reason why this potential is not capable of realisation – the Soviet pricing system. Input dominated, nonmarket price setting for producer products means that measurements of inputs and outputs to the Soviet enterprise cannot reflect opportunity costs except by accident. Further, the absence of comparable free market prices means that administrators are incapable themselves of adjusting for any resulting bias in a rational manner.

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[19] The table shown in Horwitz, p. 14, indicates depreciation rates which appear low by Western standards. However, amortisation norms were due to be revised on 1.1.72 and this effect may then have been corrected for (*ABSEES*, July 1970, p. 92).

[20] N. G. Chumachenko/N. M. Bedford, *op. cit.*, p. 35.

[21] B. Horwitz, *op. cit.*, p. 15.

[22] J. Wilczynski, *Socialist Economic Development and Reforms* (London: 1972) p. 176.

[23] The most common rate quoted is, however, 6 per cent – J. Wilczynski, *op. cit.*, p. 176.

[24] For example, the result may be to penalise management who, by their own efforts, have kept the level of enterprise profits high.

(*b*) Planning and control of routine operations

From the point of view of forward planning, the small to medium Soviet enterprise may often be in advance of its Western equivalent. Corresponding to the State Five-Year Plan, each enterprise may have a five-year plan of its own as well as yearly plans. Such a situation provides a potential for more rational long term resource use, provided that the planning mechanism is kept sufficiently flexible, which is open to considerable doubt on past evidence.

The presence of a strong budgetary and planning element in the financial system of enterprises necessarily provides an opportunity for a system of controlling routine operations through 'management by exception', such as that provided by standard costing in Western firms. The corresponding system in the USSR is, in fact, called 'normative costing', and is apparently being increasingly adopted.[25] Normative costs are calculated on the basis of current norms for materials, labour, and other expenses used in production and 'as a rule are calculated at the beginning of each month'.[26] Variances are calculated on the difference between actual costs and normative costs, although there seems to be no evidence of a separation out of price and quantity effects, perhaps understandably, since unpredicted price variances will be comparative rarities under the Soviet system. There is also no evidence of any move to imitate Western practice in constructing complicated systems of overhead variance analysis, which can be no great disadvantage. More seriously, however, it seems that the raw material for such analyses might not in any case be available, since it was suggested in one (admittedly relatively dated) article that costs were not generally analysed into fixed and variable categories.[27] If this remains true, it must seriously affect the validity of forecasts made at the enterprise level and would surely be a serious drawback to the efficiency of economic decision making in the Soviet planning system as a whole.

Budgetary control is, however, apparently used at the enterprise level for controlling indirect costs although, again, if flexible budget information is not available there must be great reservations about the significance of many of the variances which could be derived.

The standard costing and budgetary control systems used in the West have an important role to play in motivation. While they must also implicitly play such a role in the Soviet enterprise, the bonus or incentive payment system is given greater emphasis in Soviet literature as a motivational force. If it does, in fact, occupy the primary role in this area, then the incentive fund system is crucial to both the planning and control of operations and this is perhaps, therefore, the appropriate point at which to examine its mechanics in more detail:

The materials incentive fund[28]

It has already been mentioned that the total wage fund of an enterprise is a 'planned' item, although its distribution between employees is usually surprisingly realistic from a comparative market valuation point of view.

This fixed wage fund forms the basis for calculating the total materials incentive fund to be appropriated out of accounting profits for payment of bonuses.

It appears to be calculated, in general, in the following way:

Let W_t=Wage fund at time t
P_t=Accounting profit at time t
S_t=Total cash sales at time t
K_t=Total gross assets at time t
α, β=Centrally assigned coefficients, less than one and non negative.[29]

Then

$$\lambda_t=\alpha\frac{(P_t-P_{t-1})}{P_{t-1}}+\beta\frac{P_t}{K_t}$$

and Materials incentive fund=$W_t\lambda_t$
or, alternatively, for some enterprises,

$$\lambda_t=\alpha\frac{(S_t-S_{t-1})}{S_{t-1}}+\beta\frac{P_t}{K_t}$$

The bonus fund can be seen to depend on two elements, profitability $\left(\frac{P_t}{K_t}\right)$ and the rate of growth of profits or sales. The choice between the two latter for application to an individual enterprise seems to be made by the planning authorities, but their decision criteria on this question are not wholly clear.

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[25] N. G. Chumachenko/N. M. Bedford, *op. cit.*, p. 37.

[26] Ibid., p. 36.

[27] R. H. Mills/A. L. Brown, 'Soviet Economic Developments and Accounting', *Journal of Accountancy*, June, 1966.

[28] The formulae and symbolic notation in this section are taken from Horwitz, Ch. 5.

[29] For typical values of these coefficients see Feiwel, *op. cit.*, p. 296.

The reasons for not using profitability alone as a measure of efficiency are quite sound. With the new degree of discretion given to managers to undertake investments, the optimisation of profitability alone would not optimise society's return, since management might increase profitability (and hence bonuses) by reducing the asset base, i.e. by, in effect, setting a higher marginal investment return cut off rate instead of accepting all investments which exceeded the, given, cost of capital.

Thus, to encourage managers to accept more investments, and a diminishing marginal investment return, the growth factor is also built in. Horwitz has shown, however, that with some reasonable assumptions about the marginal investment return schedule and assuming that managers seek to maximise bonuses, they will not, in fact, move to the point at which the marginal investment return equals the, given, cost of capital but will stop short of it by an amount which depends on the values of the coefficients α and β and the initial size of the enterprise.[30]

Since there seems no intention, on the part of the State, to put all investments within enterprise managements discretion, however, any depressant effect this theoretical result might have on the volume of investment undertaken could, in practice, be offset by expanding centrally directed investments.

The values set for α and β are obviously crucial as far as enterprise management is concerned. A Russian source describes the setting of norms for them as follows: 'Group norms are to be worked out and approved by ministries and departments in agreement with . . . trade union councils. They are to be set by groups of enterprises . . . having essentially the same technical-economic and natural operating conditions. Branch and group norms for the formation of incentive funds are to be stable over a period of years . . .'[31]

The incentive fund is to be divided between employees other than production workers on the same basis as the wage fund. Production workers get supplementary bonuses from the fund but also have an independent regular bonus scheme.

It is important to note that calculations for the incentive fund are based on *planned* profits, sales and capital. To deal with the possibility of unrealistically high plans being set in order to inflate bonuses, a sliding scale of penalties exists for reducing the bonus fund in the event of underattainment of plans. The result is that it apparently pays, in practice, to set reasonably low attainable plans.[32]

A point of difficulty which seems to have arisen in the administration of incentive funds in practice is that central planners have effectively restricted the initiative of management by making payment of the bonuses absolutely dependent on the attainment of other goals – such as cost reduction targets, physical production, etc. This is in fact a typical illustration of the 'bureaucratic backlash' which has apparently operated since 1966 to systematically reduce the decentralisation character of the reforms.[33]

Note a further inconsistency caused by computation of the incentive fund on the basis of the size of the wage fund. The effect of this would apparently be to encourage management to hoard expensive labour and discourage labour saving investment. Such deficiencies as this have, in fact, been pointed out by Soviet writers and much experimentation has taken place with the incentive system which as a result appears to be at present in a state of flux.[34]

(*c*) Investment Appraisal

As indicated previously, prior to the reforms all investment was essentially centrally directed, although many investment proposals were generated at the enterprise level. The reforms, in fact, introduced the possibility of a degree of enterprise self-determination in capital budgeting. This is to be achieved through the use of a 'production development fund' for the enterprise, similar in nature to the materials incentive fund and representing, in part, a further appropriation of profits. The size of the production development fund is intended to determine the volume of investment funds within enterprise managements' discretion in a given period.

Total contributions to the production development fund in period t

$$=\lambda_t K_t + \gamma D_t + E_t$$

where λ_t is calculated as before, with the same alternatives with respect to the use of profit or sales growth factors, but using different numerical values for α and β.

K_t is total gross assets at time t

D_t is depreciation in time t

E_t is income from sale of surplus equipment in time t

γ is another centrally determined coefficient.

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[30] B. Horwitz, *op. cit.*, pp. 39–41.

[31] Quoted in Horwitz, *op. cit.*, p. 37.

[32] M. Ellman, *Soviet Planning Today* (Cambridge: 1971), pp. 149–50.

[33] K. W. Ryavec, 'Soviet Industrial Managers, Their Superiors and the Economic Reform: A Study of an attempt at planned behavioural change', *Soviet Studies*, Volume XXI, pp. 208–229.

[34] For some evidence of this flux see the abstracts in the *Information Supplement to Soviet Studies* from 1967 to 1970 and in *ABSEES* from 1970 onwards.

As with the materials incentive fund, it is important to note that the variables in the above formula all take *planned* values. A scale of penalties exists for reducing the actual fund contributions in the event of non achievement of plans.

Lest the importance of this move towards self-determination be overrated, it should be noted that the intention of the authorities appears to be that, in the long run, production development funds should provide for about 20 per cent of industrial investment, while the other 80 per cent will still be specifically directed through the central planning mechanism.[35]

Since enterprises should now have at least some degree of choice with respect to investments undertaken, the choice criteria used become of interest from the point of view of enterprise financial management. In fact, these criteria are, at least in theory, specified by central directives.[36] Two of the criteria used stand out as being of particular comparative financial management interest – one a comparative index and the other a general index of economic effectiveness.

The comparative index is to be used in choosing between alternative investments to achieve the same output. Prior to the publication of the latest 'Standard Methodology' in 1969, the notion of a 'recoupment period' was central to the comparison of alternative investment. The recoupment period criterion has been defined as follows: 'that the total reduction in operating costs consequent upon choosing a more capital intensive rather than a less capital intensive technique should at least equal, by the end of the period, the increase in investment expenditure incurred.'[37] The most obvious comparison, in Western terms, is with the familiar 'pay back method'.[38] The most striking difference is, in fact, the concern in the recoupment period method with the incremental *capital* effectiveness of an investment as compared with its alternatives. This may clearly be seen in symbolic terms:

Let

T_{21}=recoupment period (investment 2 compared with investment 1)

K_1, K_2 be initial capital costs of two alternatives ($K_2>K_1$)

C_1, C_2 be yearly operating costs of alternatives ($C_1> C_2$)

Then

$$T_{21}=\frac{K_2-K_1}{C_1-C_2}$$

To determine the acceptability of T_{21} it would then be compared with a normative value agreed by the central planners (T_n). If $T_{21}\leqslant T_n$ then investment 2 is acceptable on this criterion.

Instead of comparing all possible pairs of alternatives in this way, the criterion can be recast in the form:

'choose that investment for which $K_i+T_nC_i=$ minimum.'[39]

Sometimes the criterion is expressed in terms of the inverse of the recoupment period, called the 'coefficient of relative effectiveness'. A normative value may be quoted for this, rather than for the recoupment period, i.e. Normative coefficient of relative effectiveness

$$E_n=\frac{1}{T_n}$$

The latest Standard Methodology says that E_n should be set at a level normally not less than 0·12, implying a recoupment period of 8⅓ years.

In fact, although the new directive adheres to the terminology of the traditional criteria, a relatively radical change is introduced in it. This is a recognition that, where 'the capital investments in the variants being compared are made at different periods, and the current expenditures change over time, then comparison of the variants should be made by bringing expenditures of the later years to the present moment by applying a discount coefficient calculated by the following formula:

$$V=\frac{1}{(1+E_{np})^t}$$

where V is the discount coefficient, t is the period of time of discount in years and E_{np} is the normative for discounting expenditures at different times.'[40]

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[35] *ABSEES*, October 1970, p. 98.

[36] The latest of these was published in *Ekonomicheskaia Gazeta* 1969: 39. My comments are based on a translation of this made by M. Melancon of Indiana University entitled 'Standard Methodology for Determining the Economic Effectiveness of Capital Investments' kindly made available to me by Dr D. M. Nuti of Kings College, Cambridge.

[37] G. C. Harcourt, 'Investment Decision Criteria, Capital Intensity and the Choice of Techniques', reprinted in J. T. Dunlop/N. P. Fedorenko, *op. cit.*, pp. 196–7.

[38] For the Western payback period criterion, the comparable formulae, for cost saving projects, would be:

$$T_2=\frac{K_2}{C-C_2} \quad \text{and } T_1=\frac{K_1}{C-C_1}$$

where C represents the present operating costs for the application. T_2 would then be compared with T_1 and with T_n (the required payback period).

[39] The equivalence between this and the basic formula may be easily shown:

For investment i to be acceptable

$$T_n\geqslant\frac{K_i-K_r}{C_r-C_i} \quad (r=1,2,3\ldots m)$$

$(K_i>K_r, C_r>C_i)$

Rearranging:

$K_i+T_n.C_i\leqslant K_r+T_n.C_r$

i.e.

$K_i+T_n.C_i$ must be a minimum for the set of alternatives.

[40] 'Standard Methodology', pp. 33–4.

E_{np} (the 'cost of capital') has a normative value suggested by the directive of 0·08 (8 per cent). The result of the new directive would appear to be at least a *prima facie* comparability with Western DCF techniques, and in particular with the 'equivalent annual cost' method of investment appraisal.[41]

It is fairly obvious that, in addition to a criterion for choosing between alternative ways of doing the same thing, some criteria is needed for determining the acceptability of projects when compared to other, non output equivalent, projects. Such a criterion is provided by the 'general effectiveness index'. For individual enterprises this is measured as the ratio of profit to capital invested, i.e. General effectiveness index

$$K_{kp} = \frac{T_s - C}{K}$$

where

K = estimated capital costs

T_s = value of projected annual output at enterprise wholesale prices (excluding turnover tax)

C = cost of annual output.

The index so arrived at is considered satisfactory if 'not below the planning norms and analogous indices for the preceding planning period'.[42] It is not clear from the directive whether discounting is to be used in arriving at the index, if not it becomes directly analogous to the inverse of the Western pay back criterion. It would, of course, then only be reconcilable with DCF under generally artificial assumptions.

A further difficulty of reconciliation with DCF lies in the nature of the data used in the calculations. In Western DCF it is net cash flows, while the Russian calculations are influenced by their accounting conventions. Thus, 'operating costs' include depreciation, calculated on a straight line basis. A further point to note is the inclusion of expected book loss on the existing assets as part of the capital cost of the replacement.[43]

Such points emphasise the difficulties of trying to reconcile Russian practice with that advocated in the West. In fact the Russian procedure may often be more sophisticated than it has been possible to describe here – above the enterprise level various indices of socio-economic effectiveness may become overridingly important. The systematic use of such indices is an obvious result of a difference in the context of capital budgeting but, in view of our own continuing controversy over the applicability of DCF, may have lessons valid also in the West.

(*d*) Other special decision situations

In Western industry this category heading would cover such areas as price setting, abandoning a product line, make or buy decisions, etc. In the Soviet system there appears to be relatively limited scope for self determination in such areas at the enterprise level, with the result that their practical importance in the work of enterprise financial management is probably non-significant except, perhaps, in certain non-typical situations described below.

Pricing of products in the Soviet system is, in general, centrally determined. Basically, two types of prices exist: 'Producers' prices' are those obtaining between producing enterprises and other producing or wholesaling enterprises. 'Retail prices' apply to final, consumer, goods and services. The link between producer prices and retail prices does not appear to be very strong in practice, retail pricing being traditionally regarded as an essentially political decision not necessarily dependent on product costs. The industrial enterprise, however, is more intimately concerned with the determination of producers' prices.

The pricing of producer products is normally carried out above the enterprise level on the basis of weighted industrial averages of planned enterprise costs plus a standard profit margin and turnover tax, if applicable.[44] Such price determination is thus, essentially, input rather than output (demand) dominated. Some scope exists at the enterprise level for substantially influencing the pricing of those products pioneered by the enterprise via the accounting practices used in arriving at the 'cost' of such products, with potentially significant implications for reported profits and incentive bonuses. In practice, however, the rigidities of the planning system together with defects in the communication of demand information have meant that, at least in the past, relatively few pioneering decisions on product development (and associated decisions on dropping old products) seem to have been generated at the enterprise level.

Further scope for price determination by enterprise management exists with respect to 'special order' jobs, where the price is to be negotiated between the

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[41] Using E_n the recoupment period criterion can be rewritten:

$$C_1 + E_n . K_1 = \text{minimum}.$$

If we can assume constant annual operating costs and a single, immediate, capital outlay, then this is directly comparable with the Western 'equivalent annual cost' method, which could be written, using the Soviet notation:

$$C_1 + a^{-1}_{\overline{T}|E_{np}} . \quad K_1 = \text{minimum}.$$

Thus, mathematical equivalence in this simple case depends on a comparison of E_n with the a^{-1} factor. The suggested normative coefficient of 0·12, together with a discount rate of 8 per cent implies a strict equivalence between Western and Soviet techniques only when the investment life is approximately 14 years.

[42] 'Standard Methodology', p. 29.

[43] Ibid., p. 35.

[44] G. R. Feiwel, *op. cit.*, p. 131.

contracting enterprises in accordance with central regulations. Because of the continuing shortage in supply of many intermediate products, however, supplier enterprises can apparently set and obtain very high prices for such special orders.[45] Such prices can, by implication be 'justified' within the regulations through the exercise of some residual discretion in accounting practices. This appears to be a clear illustration of one set of circumstances in which the new incentive schemes may motivate accounting practices, and financial decisions, in a direction which leads to sub-optimality from the point of view of the 'monocorporation'.

Make or buy decisions are, once again, not a major area of involvement by enterprise management. Planning targets still govern the output of major product lines and the necessary inputs (through the traditional 'method of balances').[46] The introduction of contractual relationships between enterprises and even amalgamations creates the possibility of mutually beneficial production rearrangements but there seems little evidence that this has yet led to substantial involvement in make or buy decisions at the enterprise level.

Conclusions

1. Insofar as the introduction of the reforms led to an expectation of significant decentralisation of control, probably the most striking feature of the Soviet system today is the apparently very limited nature of the decentralisation that has actually occurred. As a result of this, the performance of financial management in the Soviet enterprise continues to be relatively tightly constrained.
2. In these circumstances, it would be particularly unrealistic to expect Soviet accounting practices to be immune from criticism when compared with best Western practice or theory. Some of the specific areas of possible criticism have, in fact, been indicated in this article.
3. There is also, however, evidence of continued development in Soviet financial practice, viz. the spread of normative costing, DCF type investment appraisal, the growing use of computers and mathematical techniques. The 'data manipulation' stage of information systems thus seems to have been subject to considerable revision since Campbell's earlier article.
4. There remains, however, a fundamentally unaltered weakness in the Soviet accounting system. Since the pricing of both inputs and outputs of the industrial enterprise is, in general, non-market based, transactions made at such prices will give rise to data which bear no predictable relationship to opportunity costs. Improvements in processing such data cannot, *per se*, increase their relevance for economic decision making.

To remedy this defect may involve either the introduction of free markets in industrial products or a sophisticated market simulation mechanism. The former solution is subject to political constraints. However, considerable attention has been devoted to the second alternative through the work of academics at the Central Economic Mathematical Institute (TSEMI). One approach used there has been to formulate a vast Mathematical Programming model of the Soviet economy, the dual solution values from which could provide opportunity cost determined prices. Although large scale experiments have been made with such a model, however, they do not seem to have generated a great deal of confidence as to its ultimate practical feasibility.[47]

5. A final point seems worth making. Prices serve at least two roles in the Soviet system. Firstly, as information on which to base allocation decisions. Shadow prices derived from a successful Mathematical Programming application could, in theory, fill this role. Secondly, however, prices in Russian industry also affect reported profits, incentive schemes and the freedom to invest, and hence serve to motivate different levels of performance. This motivational effect may be as important to overall Soviet economic performance as the allocative effect. Even if the allocation problem can be solved by centrally generated shadow prices, the same pricing system may not be motivationally optimal. In fact, it seems not unreasonable to suppose that optimality in this area lies in the direction of a more tangible decentralisation of responsibility, including that for price setting. Such a solution would, however, once again involve political considerations.

Thus, as in the past, advances in the efficiency of financial management of Soviet enterprises may be seen to be closely dependent on political developments. The present atmosphere of political experimentation in the wider Soviet bloc should ensure that the subject of this article will continue to provide an instructive comparative study in the development of financial information systems for some time to come.

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[45] *ABSEES*, October 1970, p. 83, gives a reasonably typical illustration of the abuse of 'one off' pricing rules. For a discussion of the difficulties involved see also: G. E. Schroeder, 'The 1966–67 Soviet Industrial Price Reform: A Study in Complications', *Soviet Studies*, Vol. XX, pp. 462–77.

[46] M. Ellman, *op. cit.*, pp. 70–4, gives a good exposition of the 'method of balances'.

[47] J. Wilczynski, *op. cit.*, pp. 74–5.

Development and Application of Accounting Theory

Charles H. Griffin and James Wesley Deskins

Introduction

There may well be a universal syndrome among academicians in all disciplines – a syndrome which springs from their perception that the theories they have constructed, the experiments they have conducted, and the measurements of physical and behavioural phenomena they have collected go unheeded by organisations and individuals in pursuit of their everyday tasks. These perceptions are joined with a conviction on the part of the academics that if only the actors in the world of daily affairs would heed the academicians' printed and spoken words, many of the world's problems could be quickly solved. We confess that as academicians who deal with 'accounting theory' we often share such perceptions and convictions. In fact, such feelings prompt this present inquiry.

So that one might appreciate the nature of the frustrations which motivate the inquiry, a specific fact situation is highlighted. In the United States, at the present time, there exists a rather animated dialogue concerning the desirability of conformity of accounting methods used for determining income on published financial statements (hereafter called 'external reporting') and the methods used for determining taxable net income for Federal Income Tax purposes. In capsule form, the nature of the controversy is as follows. Traditionally, there have been rather substantial differences between these two sets of methods. For example, a company may calculate its depreciation charges on a straight-line basis for external reporting purposes but use accelerated bases for determining depreciation deductions from revenue for Federal Income Tax purposes. Despite the existing dichotomy of methods (of which most practising accountants in the US approve) the American Institute of Certified Public Accountants (AICPA) in its past testimony before Congressional hearings has advocated 'conformity' between tax accounting and external reporting. Although the motives behind some of this testimony were undoubtedly parochial in nature, the substance of many of the specific proposals was advocacy of the extension of accrual concepts in tax accounting, as opposed to cash basis concepts. Unfortunately, the AICPA clothed these arguments with the label 'conformity', that is, tax accounting should conform to accounting for external reporting purposes. In spring, 1971 several Treasury Department announcements indicated that the Treasury was going to totally acquiesce in this long advanced AICPA argument by demanding conformity in all respects between income for external reporting purposes and taxable income, that is, a method would be acceptable for tax purposes only if it were also used for external reporting purposes.

Naturally this has caused much discussion as to the tenability of the Institute's position with respect to 'conformity.'[1] Our purpose in citing this controversy is not necessarily to address it directly, but to demonstrate that it clearly shows the symptoms of accounting practice ignoring accounting theory. In all of the discussion of this issue which we have heard (primarily among practitioners) no one has referred to *A Statement of Basic Accounting Theory* (ASOBAT).[2] This document and a notable segment of the theoretical accounting literature since ASOBAT's publication are characterised by their arguments for multidimensional measurements. Briefly, these arguments conclude that no single measure of income, or components thereof, is adequate for all purposes. Accordingly, the position is taken that several measurements of the same phenomena should be presented so that the user can select the one(s) most relevant to his informational needs. Now it seems to us that these seminal ideas in modern accounting theory are relevant in the 'conformity' debate. But ASOBAT, as such, has not been introduced into the debate.[3]

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[1] Unfortunately, much of this discussion has been in committee meetings and is not in print at this time. One item to see is Leonard M. Savoie, 'Institute Position on Conformity of Tax and Financial Accounting,' *The CPA*, LI (June 1971), pp. 18–19.

[2] *A Statement of Basic Accounting Theory* (Sarasota, Florida: American Accounting Association, 1966).

Thus, one can see why theorists ponder the extent to which accounting theory (new propositions, particularly) impacts upon accounting practice. We believe that to fully understand this impact, it is necessary to review the attributes of theory and practice, the institutional frameworks which circumscribe each, and the time dimensions of theory-to-practice application. We maintain that such a review will provide a proper perspective for understanding the rate of progress, or regress, in the acceptance and application of new theory proposals.

Accordingly, our specific purpose in this paper is to examine some of those forces operating on the plane of theory/practice interaction[4] in order that we may

(1) articulate some possible explanations of why it has been difficult for theoretical propositions to influence accounting practice, and

(2) forecast any possible future changes in theory/practice interaction.

Precedent

One of the forces conditioning the application of theory to practice is precedent. One prominent accountant has remarked that 'the accounting profession has a tendency to overemphasise precedent and to view its problems in retrospect. While history is an interesting record of human experiences, analysis and discussion of the past are helpful only to the extent that they are of assistance in performing a more useful service.'[5] In examining this force it seems appropriate to first survey the constraining role of precedent in Western society generally and then look at some specific impacts of precedent on accounting.

Sociologists argue the importance of precedent as a basic social need. One sociologist says that 'in a modern city as well as in a preliterate village, most people long for *permanent landmarks*, for a secure knowledge that the struggle for wealth, position, power, and special privilege has fixed limits, especially for others.'[6] We posit that this basic social need can be seen quite clearly in the role which precedent plays in the law, where it has reached its most formal institutional form, the doctrine of *stare decisis*. In explaining the development of this doctrine, Allen[7] describes an early Roman governance form in which the Roman ruler of a city issued an 'Edict' at the beginning of his term. This 'Edict' set out the principles by which the ruler would be guided in the administration of justice and the ruler was forbidden by law from departing from it during his term of office. Customarily, succeeding rulers' 'Edicts' included the 'Edict' of their predecessor plus whatever additions the new ruler wished to make. In England, where the doctrine of *stare decisis*, per se, originated, the early King's Courts were explicitly guided by prior decisional law, and many of the early decisions merely codified existing customs. In the United States we have generally adopted early English case law[8] but have been somewhat free in modifying it by court decision whenever the court feels that either changed conditions or an erroneous prior decision exists.

Another explanation of the *raison d'etre* of *stare decisis* constructs an analogy that some streets in older towns – Boston, for example – were once simple paths by which one proceeded from point A to point B. The first use of the path demonstrated that it worked. Others followed the same course and the paths ultimately became streets.[9] Why did others follow? Probably it can be explained by the preference (on the part of many persons) for the known over the unknown.

Generally speaking, modern US courts have preferred not to depart from prior decisions. Aigler[10] offers a reason why such a preference has developed. He submits that when a court repudiates a line of decisions, it can operate harshly upon a person who has shaped his course of action upon the assumption that he was in accord with actual law. So that the reader might gain a fuller appreciation of this *precedent* v *departure-from-precedent* issue we cite a specific issue that is troubling US courts at the moment: the doctrine of sovereign immunity, which holds that the state and its agents cannot be sued for their actions unless the state or its agent grants permission. With agents of the state providing many services directly to consumers (for example, health care through hospitals operated by subdivisions of government and rail passenger service by agents of Amtrak), we trust that one can see the consequences to consumers if these suppliers of services are not liable for their wrongful acts, and we trust that one can also appreciate the financial consequences to a municipal hospital which has based its insurance coverage on the assumption that the doctrine of sovereign immunity holds only to find upon appeal of a suit against it that such is not the case.

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[3] The multidimensional idea, but without reference to the large body of literature supporting it, has been mentioned in a letter from James H. MacNeill in *The CPA*, LI (October 1971), p. 8.

[4] It might be helpful if one visualised a plane with two balls in motion upon it. The ways that the balls respond to one another as they move about the plane depends upon such conditions as (1) the direction and force of gravity acting upon the plane, (2) the composition and size of the balls, (3) the magnetic properties of the balls, (4) the nature of any magnetic fields surrounding the plane, (5) centrifugal force created by motion of the plane, etc. If we construct an analogy of our present discussion based upon this physical model, we could label one ball as theory, the other ball as practice and analogise that we are interested in the behaviour of practice with respect to theory. And we assert that this behaviour is a function of conditions (precedent, authority, political systems, etc.) analagous to gravity, centrifugal force, magnetic fields, etc.

[5] George R. Catlett, 'Factors that Influence Accounting Principles,' in *Studies in Accounting Theory*, ed. by W. T. Baxter and Sidney Davidson (2nd ed; Homewood, Ill: Richard D. Irwin, Inc, 1962), p. 381.

[6] Arnold W. Green, *Sociology: An Analysis of Life in Modern Society* (4th ed; New York: McGraw-Hill Book Company, 1964), p. 532. (Emphasis supplied.)

[7] Charles Claflin Allen, 'Importance of Following Precedent in the Development of Law and the Administration of Justice', *Journal of the Missouri Bar*, XXVI (April 1970), pp. 190–96.

[8] For a good description of US adoption of common law and the legal tension supplied by *stare decisis*, see Walter V. Schaefer, 'Precedent and Policy', *The University of Chicago Law Review*, XXXIV (Autumn 1966), pp. 3–25.

[9] Ralph W. Aigler, 'Law Reform by Rejection of *Stare Decisis*', *Arizona Law Review*, V (Spring 1964), pp. 155–74.

[10] Ibid.

Thus, it is our observation that precedent does in fact operate as a pervasive institutional constraint in Western society and we conclude that individual and group behaviour which has merited acceptance, without regard to whether or not such acceptance has been officially ratified or otherwise sanctioned, frequently tends to constrain the acceptance of innovative proposals.

In accounting we believe we can see the role of precedent operating to constrain change in accountants' behaviour. Consider many of our ethical constraints. Are these not often formulated and followed more like an early Boston thoroughfare rather than formulated on some explicit basis giving conscious recognition to the public, interest or even professional interest? Consider the following illustration and note the accountant's quoted response as apparently possessing – in our judgment – a Freudian significance.

Recently an American public accounting firm agreed to buy a $3·5 million debenture from a small life insurance company after state regulatory authorities challenged the audit conducted by the firm and the firm resigned as auditors of the insurance company.[11] Naturally wondering about the propriety of this kind of arrangement, a *Wall Street Journal* reporter contacted 'one top authority on accounting' and asked him about the reported arrangement. His reported response was 'Oh my gosh! That's weird. I've never heard of anything like that.' Accordingly, in this instance, spontaneous reaction to the query, the respondent did not react to the propriety of the arrangement; his reaction rather dealt *only* with the fact that the action was contrary to precedent. How many theorists have listened to similar responses?

Is not professional behaviour with respect to some auditing standards essentially of the nature of following precedent? Consider the importance that US accountants have attached to confirmation of receivables (an Auditing Standard since 1939). Generally speaking, accountants have dutifully observed and supported the standard, presumably because there was evidence that these confirmations were providing dependable information for the auditor. However, recent empirical studies have questioned the efficacy of this procedure.[12] Thus, accountants' behaviour over the years with respect to this auditing standard must be explained in terms *other than* reliance on a procedure which was being continuously checked for validity and reliability. We posit that this behaviour is explained through reliance on precedent – in this case a codified precedent.

There are, of course, certain aspects of the decisional law referred to above which operate to stultify new developments in accounting. By examining the dual accounting treatment of the same phenomenon, where on one side there is a legal precedent and on the other side there is not, one may be able to see the specific impact of the legal precedent. Consider the issue of stock dividends. Although it was once held by a court that stock dividends were not income to the recipients (whereas cash dividends were income),[13] to our knowledge, there is no legal ruling on how a corporation should view the impact of stock dividends on its capital structure. Now note that financial accounting universally holds, as far as the stockholders are concerned, that stockholders receive nothing of value when stock dividends are distributed, but it has allowed the opposing view in certain instances when examining the same phenomenon from the point of view of the corporation.[14] We aver that it is plausible that this specific legal precedent is responsible for this differing viewpoint on stock dividends.

We think that the phenomenon of devotion to precedent is mainfest in the recently released Accounting Principles Board Opinion on Accounting

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[11] See *The Wall Street Journal*, 1 October, 1971.

[12] See Gordon B. Davis, John Neter, and Roger R. Palmer, 'An Experimental Study of Audit Confirmations', *The Journal of Accountancy*, CXXIII (June 1967), pp. 36–44; E. Scott Maynes, 'Minimizing Response Errors in Financial Data: The Possibilities', *Journal of the American Statistical Association*, LXIII (March 1968), pp. 214–27; and Eugene H. Sauls, 'An Experiment on Nonsampling Errors', *Empirical Research in Accounting: Selected Studies 1970* [A supplement to Volume 8 of the *Journal of Accounting Research*] (Chicago: The Institute of Professional Accounting, 1971), pp. 157–71.

[13] Eisner *v* Macomber, 252 US 189 (1919).

[14] It is the distribution of something of value idea which supports differing treatments of 'large' and 'small' stock dividends *vis-à-vis* the corporation's capital structure.

Changes.[15] This opinion creates a presumption that an accounting principle once adopted should not be changed in accounting for events and transactions of a similar type. Although accountants would generally justify this opinion by using their jargon about the virtues of 'consistency', could not the whole issue be debated using the *precedent* v *departure-from-precedent* language with the 'need to change with changing conditions' as opposed to 'harm and discomfort to individuals if change is effected' as polar reference points?

Authority

Any realistic assessment of the influence of authority on the development and application of accounting theory is that in general its contribution has been one of constraint. The dimension of authority has been viewed variously as extending from *the capacity to exercise power or command* to *influence born of esteem, character, station, mental or moral superiority*. These defining phrases appear to accommodate both the unmitigated authority imposed by prescription (with collateral enforcement as an appendage) as well as the less formal and milder authority imposed by personal self-discipline.

Additionally, the authority spectrum encompasses – or so it seems to the authors – both the licence or constraint which is extra-professionally generated as well as that which is intra-professionally inspired and produced. The first of these sources necessarily includes legislative pronouncements, legal opinion (including numerous regulations of governmental agencies), official recommendations of supervisory bodies, and various interpretative rulings. The second source would presumably include that restraint or influence which derives from imposed personal self-discipline or direction, custom or convention which has merited acceptation, the acquiescence in individual or group opinion, and imposed regulations and standards of professional societies. This dichotomy accents that authority need not necessarily possess the organisational trappings and the formality of legal dictum and that it may well exist (and indeed, thrive) on more informal levels, in which personal and group opinion is the principal cogent influence.

Within the United States a variety of organisational bodies presently issue pronouncements concerning the theoretical fabric which comprises the rationale for the practice of accounting. The Securities and Exchange Commission regularly issues statements with respect to recommended accounting and reporting practices. Additionally, the Internal Revenue Service stipulates prescribed accounting practices which must be followed with respect to the calculation of that elusive figure of taxable net income. An almost endless dialogue might be engaged in with respect to this governmental force and its effect on elections of accounting practitioners. Numerous other governmental agencies periodically render judgments as to preferable accounting procedures, usually in specified professional contexts. *Within* the profession, authoritative groups such as the American Institute of Certified Public Accountants (principally through its committees and its Accounting Principles Board) the American Accounting Association, the Financial Executives Institute, and numerous other bodies of accountants, periodically issue individual statements or make pronouncements which support a particular desired procedure for the practice of accountancy. These individual statements may or may not be consonant among groups. It is lamentable that all too often these judgments are made on the basis of expedience and under rather severe time constraints, which accents that they are not often predicted on that kind of well-considered deliberation which would hopefully provide them with both necessary generality and validity. Professor W. T. Baxter remarked about the importance of recommendations by authoritative bodies (particularly those of an intra-professional orientation) when he noted that '. . . men do not always become better at research merely because they work as a group, second, if authority takes direct part in the pursuit of truth it may hinder rather than help; third – and most important – there are no sure signs by which truth can be recognised.'[16]

We are of the opinion that authority which generally conforms to the defining expressions given earlier in most instances tends to constrain and inhibit the development of accounting theory – at least the innovative quintescence of that theory. This does not gainsay that authority may – and does – provide appropriate support for well conceived theory and thereby promote – perhaps even assure its *acceptance;* in so doing it may render a most valuable service important to the implementation of theory.

This paper thus suggests that authority has spectral dimension, resting on *power* as one limit and on *willing acceptance* as the other. We are persuaded that authority has significant potential malevolence when it is conceived of as total capacity to control with related enforcement support. Authority appears to achieve a more acceptable form in a professional context when it promotes practitioner action by persuasion generated by logical argument. We are generally in accord with – though not totally committed to – Professor Baxter's conclusion that, in the end, recommendations based on authority will probably produce harm. 'They are likely to yield little fresh knowledge – they are likely to weaken the education of accountants – they are likely to narrow the scope for individual thought and judgment; and any group of men who resign their hard problems to others must eventually give up all claim to be a learned profession.'[17]

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[15] *Accounting Changes*, Opinion of the Accounting Principles Board No. 20 (New York: American Institute of Certified Public Accountants, 1971).

[16] W. T. Baxter, 'Recommendations on Accounting Theory', in *Studies in Accounting Theory*, p. 420.

Socio-Politico-Economic Systems

It is our observation that the socio-politico-economic system of a particular society exerts a great influence on the rate of acceptance of new theoretical proposals, especially when such proposals do not accord with the existing socio-politico-economic structure of that society. Our impression seems to be shared by persons who have devoted much thought to the problem of 'international accounting'.

Mueller[18] suggests that reasons for accounting differences among countries is 'the influence of particular economic phenomena',[19] giving as an example that 'developing' nations are particularly desirous of a type of accounting which will foster the fastest growth possible.

Wilkinson takes a more socio-political viewpoint by observing that '. . . accounting principles (in the US) are directly due to our many small investors, while different principles and more limited disclosure exist in, say, Europe and South America because business obtained their capital from a few wealthy stockholders.'[20] A variant on this idea is to say that a society's institutional arrangements for supplying capital have a significant influence on accounting. For example, in societies where capital is supplied by an instrumentality of the state, 'external reporting', as we know it, has not flourished as it has in countries where capital is supplied by a market system. Contrariwise, non-market capital allocation systems appear to provide 'managerial' type reports to actual capital suppliers more often than do market systems.

To these reasons for difference we would add that accounting principles are likely to differ among countries if those countries differ in degree of conformity between formal and informal standards of behaviour. Consider the following illustration (facts adapted from Wilkinson[21] based on conditions in 1964). Germany and the US differ with regard to hidden reserves, with hidden reserves being more permissible in Germany than in the US. To illustrate how such tolerance for hidden reserves is a function of divergence of formal and informal behaviour standards, let us take as given an informal behavioural characteristic that businessmen greatly desire to use some of the resources provided by profitable operations to finance expansion. Germany, however, requires (a formal behavioural standard) business to declare all their profits as dividends. Thus, one may observe the conflict between the formal and informal standards, and he can also see that the hidden reserve device is a mechanism whereby the formal and informal standards can be reconciled. In the US, where there is no formal behaviour standard with regard to dividend policy to conflict with the informal standard of using resources provided from earnings, no such tolerance for hidden reserves exists.

Another differentiating element among various societies might be called 'openness'. For example, it is widely believed that some societies have much greater traditions of business secrecy than others.[22] Although this notion cannot be examined fully in this paper, one is justified in asking if this 'openness' phenomenon in a society is functionally related to the conformity between formal and informal patterns of behaviour? Should not a society whose informal and formal patterns tend to coincide have less of a tendency to be secretive about reporting what they have actually done?

Although for the sake of convenience we have discussed the socio-politico-economic impact with respect to existing differences among societies, we feel it is clear without detailed argument that societies would tend to reject new theoretical accounting propositions which implied accounting practices not wholly consistent with a particular society's socio-politico-economic matrix.

Lest we citizens of the developed countries sound like we believe that it is only underdeveloped countries which use national goals as bases for accepting or rejecting certain accounting treatments, we invite you to examine the US problem in dealing – in an external reporting sense – with the 'Investment Credit'.[23] Although the US accounting profession initially proposed that these tax benefits be reflected in income as the acquired property was used, the Federal bureaucracy exerted much pressure for acceptance of a procedure which would allow current reported earnings to reflect the total tax benefit in the year received. In any event, the US accounting profession ultimately approved both treatments as acceptable. Obviously (and for economic policy reasons at the time), the Administration desired higher reported business income. Now that the US is about to restore the Investment Credit (it has not been operative recently), it is interesting to speculate about pressure from the current Administration on accounting treatment of the Investment Credit under current economic and political conditions. There now exists an incomes policy limiting changes in prices and wages, but without limitations on business earnings, accompanied by intense domestic political criticism from the opposition because of that lack of a limitation on earnings.

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[17] Ibid, p. 427.

[18] Gerhard G. Mueller, 'Dimensions of the International Accounting Problem', *The Accounting Review*, XXXVIII (January 1963), pp. 142–7.

[19] Ibid, 142.

[20] Theodore L. Wilkinson, 'Can Accounting be an International Language?' *The Accounting Review*, XXXIX (January 1964), p. 134.

[21] Ibid.

[22] Ibid.

[23] A tax policy which allows business to deduct from its tax liability in a given year a percentage of the amount expended that year for new plant and equipment.

Although the examples we have cited are few, we think they are indicative of some rather pervasive conditions which tend to insure that differing socio-politico-economic conditions among countries affect both the present state of accounting theory and practice in a country and also influences the probability of acceptance of new theoretical proposals.

Environmental Impacts

Within the past decade, both American and English industrial strength and imagination have generated societal and cultural life-styles characterised by affluence and technological innovation. Yet, the consequence of this economic and social success has paradoxically yielded numerous unfortunate ancillary consequences. There exists growing ferment in both cultures as to the value of, and direction implicit in, existing social arrangements. Challenges are increasingly heard as to the merit of the ethical foundations of our industrial system and its impact upon the life-styles and well-being of its citizens. The presence of continuing over-population, alleged pollution of the environment, and continued exaggeration of disparate wealth distribution – all become new objects of concern and matters that must be dealt with explicitly by accountants.

This strident call for change in our industrial community by which to improve quality of living compels a re-examination of the nature and magnitude of economic and social sacrifice. Increasingly, one is reminded that profit alone is no longer an appropriate single index of corporate good performance. Rather, the measurement of business good fortune – it is argued – now must ascribe magnitudes to such variables as sensitivity to public disorder, crime, stagnation in transportation systems, hazards to general health, the achievement of an optimal leisure-time balance and other environmental influences.

Industry in its response to these growing evidences of concern and criticism may reply that its appreciation of the public's 'enlightened self interest' is already evidenced by numerous signs of a new awareness of the importance of the public welfare. If one can accept as accurate this new focus of corporate motivation, then presumably new accounting criteria, new systems of measurement, new vehicles for public disclosure and information dissemination – all should be the consequence of this self-assessment; hopefully, it will provoke an enlarged public confidence in the accounting profession.

It should be noted that accounting theory, in its external reporting dimension, thus far has embraced traditional environmental dimensions. Accounting has been perceived of as providing information primarily about the decision functions of management in a context in which they principally bear upon external forces, that is, accounting reports to external parties. If these new information vehicles are to be developed, necessarily, accounting theory in its broader dimension must transcend this parochial role and give increased attention to the development and propagation of information about not only the business enterprise but also its environmental setting and its social responsibility. The new dimension of accounting which recognises the variables of ecological change and social value importunes accountants to restudy the theoretical frameworks with which they have been heretofore concerned. Recent articles in numerous technical journals have focused upon ecological impacts on accounting theory development, the questions of measurement introduced by the new 'imponderables', the necessity of redefinitions of cost, and the overall concern for the contributions to which accounting as an information system may make to society's betterment. The growing attention to these variables is remarked upon by Beams and Fertig in a recent *Journal of Accountancy* article. They suggest that accounting must remain sensitive to these important environmental influences. They suggest specifically that:

> accounting can and should provide disclosures on pollution costs so that financial statement users are informed of efforts at abating pollution and the possible lack of comparability in financial statements of different firms. The quantitative data presented in financial reports should meet accounting tests for data accumulation and reporting. All disclosures should additionally meet the tests for attestation.[24]

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[24] Floyd A. Beams and Paul E. Fertig, 'Pollution Control through Social Cost Conversion', *The Journal of Accountancy*, CXXXII, (November 1971), pp. 37–42.

Similarly, Parker[25] focuses upon ecological inputs to accounting's information system. He argues that ecological variables are essentially human problems, which in turn seems to draw upon the assertive position that the objects of accounting are basically the behaviour patterns of individuals, considered singly or in groups. He argues that the solution to these problems should have as their objective the maximisation of human welfare which necessarily compels one to ask the question of how one should view the welfare of society *vis a vis* the individual. Parker considers as did Beams and Fertig the importance of re-examining the notion of 'costs' as an element of economic sacrifice but additionally reviewed the role of cost in the context of social deprivation. The principal merit of each of these articles is that they introduce (albeit belatedly) a new perspective in terms of which environmental problems may be assessed with particular attention to the role of the importance of information.

Educational Heredity

We have in the previous discussion referred to several – a selected few – important conditioning influences which either promote or retard the innovative importunings of accounting theoreticians. They include the role of precedent, authority, institutional forces (economic, political and social), and the impacts of various environmental factors. While this list is necessarily fragmentary, it is important to note that there remain other forces of varying degrees of importance which also impinge upon the development of theory and its acceptability by practicing accountants. One of these which deserves particular mention is the educational preparation for careers in accounting. The university atmosphere is necessarily one of relative detachment and accordingly provides the student (in a comparatively short time span) with an opportunity for study of (and reflection on) the theoretical constructs of accounting, which study hopefully provides particular direction and dimension to his future life as a practitioner of accounting. We are persuaded that the professor-student interchange in the collegiate academic setting necessarily sets limits to his capacity for practitioner action for the remainder of his professional life. If this surmise be reasonably accurate, then there is necessarily a relatively long time-lag between educational innovation and that professional performance which draws upon this innovative prior collegiate experience.

Our associations and liaison with practitioner members of the accounting profession – which happily remain relatively close and harmonious – suggest that the particular tools, techniques and other theoretical 'impediments' acquired by the student in his academic experience sets boundaries upon his creative ability and subsequent innovative spirit as a practitioner. These contacts also suggest that the 'impedimenta' acquired by a particular student are temporally determined. Illustrative of this argument is our perception that among today's US practising accountants only the more recent entrants to the profession have special expertise and informed appreciation of the newer measurement tools, new analytic techniques, computer applications and other current technological influences. This does not gainsay that the experienced – more mature – members of the profession can, and do, draw upon other credentials which usefully supplement these educationally acquired tools. Yet, if our perception be accurate, it does acknowledge that each succeeding generation of professional accountants is uniquely qualified to perform a service to the general public (and more immediately and directly to clients) which is essentially different in essence. Professional innovation and change necessarily – so we would argue – must be expected from those who have been most recently exposed to the academic influences which promote this change.

It is evident that many practitioners are seeking to rearm themselves with the tools and techniques of the accounting modernist by directing attention to professional development courses and otherwise engaging in a variety of postgraduate programmes. Some might contend that this rearmament phenomenon seriously affects our preceding argument. Nonetheless we are persuaded that these programmes can, at best, provide the accountant with an appreciation of the *existence* of new techniques and variables which reflect upon the decision algorithm of businessmen and we are persuaded that these programmes patently fail to provide the accountant with facility for dealing with these analytic forms in an operationally significant manner. No criticism is directed toward the practising accountant for desiring and achieving this gossamer-like understanding of some of the newer influences which bear upon decision functions because the time constraints and the exigencies of accounting practise prevent more than a mere introduction to the subjects typically dealt with in such professional development courses.

Conclusion

The authors in this inquiry have sought to expose some of the more cogent influences which appear to circumscribe the practice of accountancy and provide its rather unique coloration. Some of these are believed to be formidable impediments to the acceptance of creative accounting theory proposals. Like many other academicians, the authors have experienced a not uncommon sense of frustration in their perception of the practitioner's apparent intransigence in giving due attention to recommendations in, and conclusions of, their research. Yet, this study has led them to a fuller appreciation of the importance of the numerous variables which impact on the implementation processes of our art. Each variable to which reference is made appears to act as a catalyst – either serving to accelerate or to retard the rate (or the fact) of acceptance to rejection of new theory recommendations.

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[25] James E. Parker, 'Accounting and Ecology: A Perspective', *The Journal of Accountancy*, CXXXII, (October 1971), pp. 41–6.

Specifically, we find the roles of authority and precedent essentially ones of constraint. These conditioning influences have in many instances 'protected' what might have otherwise been a special vulnerability of accounting practice to fanciful creativity in our art; yet, these same barriers may have been – in other instances – sufficiently impenetrable to damp the sparks of progressive change. The cultural milieu of accounting (including its economic, social, and political forces) has either promoted or retarded innovative theory implementation depending upon both the nature of the specific force and the nature of the culture's prevailing systems (or subsystems) which allow these forces to interplay upon accounting's processes. We are somewhat more sanguine concerning our perceptions as to the accountant's sensitivity to the new information inputs to our decision functions, particularly the increased awareness of the importance of environmental relevancies. Additionally, we posit that an appreciation of the inevitability of the education-practice time differential should surely assuage the impatience of both educator and practitioner. Given this appreciation and an improved understanding of these few variables (of which there must surely be a much larger roster), we remain hopeful that an improved theory distillate will continue to infuse itself throughout accounting practice.

Replacement of Equipment

H. H. Scholefield

Introduction

This article summarises the results of a survey evaluating the equipment replacement decision of 20 companies.* The information was collected from senior executives between March 1970 and March 1971. Information about the companies is summarised in Table 1.

TABLE 1
The industry and number of firms visited

Industry	*Number of firms visited*
Iron and steel	8
Engineering	
Machine and small tools	4
Iron foundry	1
Precision metal alloys	1
Spring manufacture	1
Motor vehicle manufacture	2
Chemicals	
Synthetic resins	1
Household chemical products	1
Confectionery	1
	20

The companies in the survey that had diversified interests are categorised according to their predominant activity. In all industries the companies considered the market was growing with one exception, that of confectionery, (excluding one industry in which the company interviewed believed the industry situation was uncertain). The companies within those industries were moving either more or less with the industry market trend or at a faster rate (excluding one company which was moving slower than the market trend, one company which was uncertain and one company which refused to disclose this information). This information emphasises the importance of looking at changing output and thus consideration of product price and revenue changes in connection with replacement of equipment.

Objectives of the survey

The objectives of the survey were to find out:

1. What factors led to decision to replace equipment.
2. What alternatives were considered.
3. What information was used and what assessments were made in replacement evaluations.
4. What information could be obtained for use in a replacement assessment.
5. What post audits of replacement decisions took place.

Results of the survey

1. What reasons lead to a replacement decision

The factors suggested in the questionnaire underlying a decision to replace were:

(*a*) Physical deterioration;
(*b*) Possible cost savings;
(*c*) Change in final product;
(*d*) Quality and technical improvement of latest new machine;
(*e*) Any other factors.

It was appreciated that in many cases the first four factors were inter-related and so people interviewed were asked to grade the above. Three of the firms found it impossible to grade the factors although they intimated all were applicable. Of the remaining 17 firms the factor clearly of most importance was (*b*) followed by (*a*), (*d*) and (*c*) respectively. It should be pointed out that the overall differences between (*a*), (*d*) and (*c*) were so small that any ordering would be meaningless. This confirms the results of earlier writers.[1]

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*The author is indebted to J. R. Franks (London Business School), B. J. McCormick (Sheffield University), Professor K. J. W. Alexander and N. S. McBain (University of Strathclyde) for helpful comments and assistance on earlier drafts.

[1] R. R. Nield, 'Replacement Policy', *National Institute Economic Review*, No. 30, 1964.

2. Alternatives considered

The consideration of alternatives for any capital expenditure is of the utmost importance especially for equipment replacement. The majority of firms visited admitted that consideration of alternatives is almost negligible with regard to decision making on the replacement of equipment. Previous writers[2], have pointed out explanations for this:

(i) The 'must investment'. Here alternatives are not considered because it is fallaciously believed that the only possibility is the replacement of the equipment in question.

(ii) The 'routine investment'. Here periodic investment apparently makes analysis unnecessary.

In the survey the alternatives put forward other than buying brand new equipment or keeping existing equipment were:

(*a*) To lease equipment;

(*b*) To purchase second-hand equipment.

Only one firm out of the 20 said it considered leasing. Although leasing compared to purchasing is a financing decision it nevertheless provides the alternative of obtaining new rather than keeping existing equipment. The reaction from one interviewee was: 'It is surprising how well the leasing exercise compared with the purchase of a machine.' Although this was a necessity situation it does emphasise the importance of considering alternatives.

Six of the 20 firms said that they considered purchase of second-hand equipment. Of these firms, one firm said they considered it often and another firm considered it often with respect to a certain area of equipment where they did not require high precision and there was a good second-hand market to purchase from. Of the 14 remaining firms occasions when second-hand equipment was purchased were restricted to:

(*a*) The switching of equipment within the group;

(*b*) In emergencies (to get the engineer out of trouble);

(*c*) When another company has gone into liquidation and its equipment is for sale.

These three occasions mentioned above are not due to consideration of purchasing second-hand equipment but occur by chance or circumstance forcing the decision on a firm. Although not specifically mentioned in the questionnaire some firms pointed out that sometimes when major overhauls took place on pieces of equipment, improvements were also incorporated which diminished the technical advantage of the latest new machines over existing pieces. This, of course, poses the alternative of remodelling the existing equipment.

3. Information used and assessment made

(*a*) *Information used*

Many replacement decisions turn on the anticipated cost savings but in cases where the quality or quantity of output is changed then revenues as well as costs have to enter into the comparison. Costs and revenues which are common to alternatives can be disregarded in making decisions. All the firms in the survey estimated the revenue/output of the old and new processes, the capital cost of the new machine, the operating costs of the new machine and the operating costs of the old machine. Decisions to replace machinery and equipment were in general backed by written estimates of operating costs. However, over half of the companies interviewed kept the estimates of operating cost savings constant over the estimated life of the asset, thus taking no account of deterioration. Only five companies used a price index or continued past trends in computing the return.

(*b*) *Appraisal*

Respondents who estimated cost savings were asked what method was used to relate these to capital costs. Five possible techniques of appraisal were suggested:

1. Payback;
2. Accounting Rate of Return;
3. DCF (Discounted Cash Flow);
4. ORH (Optimal Replacement Method);
5. MAPI (Machinery and Allied Products Institute Method).

(1) *Payback*

The payback period is the period of time in which capital outlay is recovered from earnings or savings. There are numerous ways of calculating the payback period. The possibilities encountered for savings and capital outlay from the firms visited were:

(*a*) Savings: first year savings, constant annual savings, actual savings for each year. They may or may not include accounting depreciation, they may be before or after interest and tax.

(*b*) Capital outlay: capital cost before or after investment incentives, e.g. cash grants, before or after scrap value of existing equipment.

Some of the above combinations are not reliable measures of the payback period.

The limitations of payback have been pointed out by many writers, e.g. (3) with regard to the measurement of profitability. As a liquidity and risk measure it is useful and should be calculated net of tax as it is the cash flow we are trying to obtain. Firms in the survey who used the payback criterion were asked if under the old system of investment incentives they considered the cash grant, whether they took into account accounting depreciation, whether they considered tax and interest in calculating payback periods.

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[2] J. Dean, 'Measuring the Productivity of Capital' *Harvard Business Review*, Jan–Feb 1954.

Fourteen of the 20 firms used payback as a criterion of appraisal.

Ten of the 14 companies neglected taking taxation into account and only one of the 14 firms used the correct payback assessment. It is surprising with so much publicity being attached to the importance of tax in the last few years how many firms in this survey did not take it into account.

Correctly computed the payback period is useful in evaluating replacement and new investment projects under the following conditions:

(*a*) Where the amount of money involved is small and does not justify time being spent in making a detailed assessment.

Amongst the surveyed firms there was very often a minimum level below which only payback was applied; for investment over this level it was used to complement more detailed assessment.

(*b*) Where high risk is involved.

The acceptable length of the payback period was applied by firms with flexibility dependent on general economic conditions and the type of equipment.

(2) *The accounting rate of return*

The accounting rate of return is defined as the ratio of profit, after deducting accounting depreciation, to capital. This result is then compared to the company's cost of capital. Profits can be taken as initial profits or some form of average profits but whichever is taken should be considered after tax. Similarly capital can be defined as an initial or the average capital.

The criticisms that can be levelled against accounting rate of return are as follows:

(i) The variations outlined above (and there are many more) represent different accounting procedures for allocating costs to the individual years for the purpose of measuring income and financial conditions year by year. They are conventional or arbitrary in nature and introduce a subjective element into the result which leads to difficulty in interpretation.

(ii) It neglects to take into account the incidence of cash flows, since present and future cash flows are given the same weighting.

Furthermore the rate of return computed by this method is not comparable with the cost of capital. Other criticisms of the accounting rate of return can be found in the basic literature.[3] Of the 20 firms in the survey nine used the rate of return criterion and they were asked if under the old system of investment incentives they considered the cash grant, whether they took into account accounting depreciation, whether they considered tax and interest in calculating rates of return.

Only one company out of the nine took taxation into account and furthermore this was the only company that used the correct assessment for computing the accounting rate of return.

(3) *Discounted cash flow method*

The two methods encompassed by the term discounted cash flow are:

(i) DCF yield or Internal Rate of Return (IRR);

(ii) Net Present Value (NPV).

For an explanation of the advantages, disadvantages and application of the above any general text will serve.[4]

The superiority of DCF over the accounting rate of return as a measure of profitability lies in:

(*a*) Its recognition of the time value of money.

(*b*) Its use of cash flows which avoids the problem of alternative accounting treatments of depreciation, etc.

(*c*) The comparability of IRR with the company's cost of capital.

Firms in the survey who used DCF were asked if under the old system of investment incentives they considered the cash grant, annual allowances and taxation in the computation. Fourteen of the 20 companies used DCF.

One firm did not take account of the cash grant and two firms did not take tax into account. It should be pointed out that DCF was in general only used in the surveyed firms for large projects which are few and far between. Consequently, although a high proportion of firms take taxation into account when using DCF the overall incidence of tax being considered depends on the ratio of total capital expenditure on small projects to that of large projects.

Under straightforward DCF the new equipment often has a longer prospective life than the present equipment. A valid comparison can be made only for the service period common to both items of equipment unless some specific assumption is made as to what will be done during the period after the life of the present equipment expires. This directly involves the problem of calculating the economic life of equipment. The problem in the case of replacement is that there are two questions to be answered:

(*a*) When should existing equipment be replaced to maximise the return.

(*b*) How long should the new equipment be kept to maximise the return.

It is these two questions which the last two methods of appraisal attempt to answer.

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[3] A. J. Merrett and A. Sykes, '*Capital Budgeting and Company Finance.*

[4] A. J. Merrett and A. Sykes, *Finance and Analysis of Capital Projects.*

(4) *The Machinery and Allied Products Institute method*

The MAPI (Machinery and Allied Products Institute) developed a model designed to integrate a number of factors in making the replacement decision. Originally[5] the solution attempted to answer both questions. The adverse minimum (the lowest combined time adjusted average of capital cost and operating inferiority obtainable from the machine) were computed both for the challenger (new equipment) and the defender (existing equipment). The function of the replacement formula was to see whether the best mechanical succession headed by the present challenger yielded a lower adverse minimum than the best succession headed by the defender.

There were two important assumptions made:

(i) Future challengers will have the same adverse minimum as the present one.

(ii) The present challenger will accumulate operating inferiority at a constant rate over time.

Although both (*a*) and (*b*) have been answered the latter has not been answered satisfactorily. The replacement cycle because of the assumptions is a constant life cycle leaving no room for flexibility.[6]

This technique was further modified[7] to measure the urgency of a project as compared with going on without it for one more year (i.e., it derives an after tax return on the net investment in the project as compared with the alternative of not replacing). In other words, it is a measure of the economic advantage realisable by replacing now instead of postponing the replacement for a year.

(5) *The optimal replacement method*

The second method that of ORM (Optimal Replacement Method)[8] employs calculus which has permeated the literature on replacement.[9] The objective of this method is to find how long to keep the existing equipment assuming that we know the life of the equipment that will replace it. It is the basic approach of the classical cost minimisation of an infinite sequence of replacement assets. As pointed out by the authors linearity for technical improvement (obsolescence) and deterioration assumptions are necessary so that successive generations of assets will have identical optimal lives.

When the people interviewed in the survey were asked about these two methods none of them had heard of them let alone used them. Whether this was due to failure to present the methods in a manner understandable to management or to inherent characteristics of the methods remains unanswered.

Information that could be obtained

All the companies could and did estimate the output (revenue) for the old machine and new machine, the capital cost of a new machine and the operating costs of the new machine (with one exception). Fourteen firms used the operating cost of the old machine last year, five firms estimated next year's. Most firms predicted their operating cost savings as being constant. The majority of firms felt they could predict the capital cost and operating costs of a new machine next year and those of an existing machine if kept for another year but in practice very few firms did this.

Post audit procedures

Thirteen of the 20 companies had some form of post audit procedure, three companies did not, three were in the process of incorporating it and one company had a system but in practice it was not used. When asked how the actual and estimated results compared, seven companies felt that they generally tied up, four companies felt that they were generally conservative and two companies said that they were widely scattered.

Conclusions resulting from the survey

1. Payback and Accounting Rate of Return are used except on large projects where Discounted Cash Flow (DCF) is used. In the case of Payback and Accounting Rate of Return very often an incorrect calculation is employed.
2. Taxation and Investment Incentives are seldom considered except on large projects (i.e. DCF evaluations). Therefore the effect of Government Investment Incentives depends on the ratio of total capital expenditure on small projects to that on large projects.
3. In the survey no knowledge was shown or use made of the more up to date replacement techniques, i.e. Machinery and Allied Products Institute approach (MAPI) and the Optimal Replacement Method (ORM).
4. Consideration of the alternatives of leasing or purchasing second-hand equipment in connection with replacement is seldom taken into account.
5. It is clear that in the case of some of the surveyed companies there is a second-hand market for their equipment but this variable is not taken into account in the companies' appraisals.
6. Generally there was a lack of post audit of the investments, and of the firms that did carry out post audit procedures little or no feed back of errors was made to improve their later appraisals.
7. When considering a machine becoming older both

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[5] G. Terborgh, *Dynamic Equipment Policy*, McGraw Hill, New York.

[6] R. C. Stapleton, D. B. Hemmings and H. H. Scholefield, 'Technical change and the optimal life of assets', *Operations Research Quarterly*, March 1972.

[7] G. Terborgh, *Business Investment Policy*, MAPI, 1958.

[8] A. J. Merrett and A. Sykes, 'The Optimal Replacement Method', *Journal of Management Studies*, 1966.

[9] V. L. Smith, *Investment and Production*, Harvard U.P.

the possibilities of maintaining output with increased operating costs and reducing output were situations which occurred in practice. None of the surveyed companies considered these possibilities in its computations.

8. The majority of firms interviewed were in a situation where replacement was associated with expansion. In this situation the possibility of product price changes occurs in practice. This was not taken into account in the surveyed firms' computations.

9. The firms interviewed clearly implied that they could predict the variables concerned with the replacement problem to a better degree than was presently done.

10. In come cases where price could be reduced via technical improvement it was not to counteract inflation. All models produced so far are in real terms. This may have been applicable in the 1950s but the difference between price and wage inflation now is such that they should be considered as separate variables when assessing replacement problems.

Appendix I
The questionnaire

The questions and the tabulation of replies are as follows.

The market situation

Question 1 was 'What types of industry are you in?' Companies which were diversified were classed in an industry if the largest part of their turnover arose out of that industry.

The industry and number of firms visited.

Industry	*Number of firms visited*
Iron and Steel	8
Engineering	
Machine and small tools	4
Iron foundry	1
Precision metal alloys	1
Spring manufacture	1
Motor vehicle manufacture	2
Chemicals	
Synthetic resins	1
Household chemical products	1
Confectionery	1
	20

Question 2 was 'What is the trend of those industries with regard to growth or decline?' All companies were in an expanding overall market with the exception of one company which was in a static/declining market and another that believed the industry market situation was uncertain.

Question 3 was 'How has your share of the market varied with the total market trend?'

Response –

Faster than market	*In line with market*	*Slower than market*
8	9	1
Non disclosure	*Uncertain*	
1	1	

Factors which led to replacement and alternatives considered

Question 4 was 'Do you replace like with like?' (i.e., there is no technical improvement factor just deterioration). Of the 20 companies there were only two where this occurred.

Question 5 was 'Do you consider leasing and purchase of second hand machines?'

Response –

Consider Leasing	*Do not consider Leasing*	*Consider second-hand machines*	*Do not consider second-hand machines*
1	19*	6†	14‡

* Three firms had embarked on leasing projects, two in capital rationing situations, the third had an agreement with the manufacturer for a particular piece of equipment.

† Of the six firms, one firm considered it often and another considered it often for a particular piece of equipment where they did not require high precision and where there was a second-hand market.

‡ Of these fourteen firms: (*a*) two firms switched equipment within group; (*b*) four firms purchased second-hand equipment in emergencies, e.g. to get engineer out of trouble; (*c*) one firm purchased second-hand equipment in case of company liquidation.

Question 6 was 'Do you consider a single replacement or a replacement chain?' All firms considered a single replacement with one exception and that firm only considered it in the case where there was no technical improvement.

Question 7 was 'What are the main types of machinery and equipment which require thought with regard to a decision on replacement?'

(*a*) What is split between single machines and batches?

(*b*) Up to what level is capital expenditure made?

(*c*) What level is majority of capital expenditure at?

In answer to (*a*) nine companies had a majority of single machines, seven companies had a majority of batches of machines, two companies had virtually an equal split between the two and two companies did not disclose this information.

In answer to (*b*) the results are tabulated on p. 322:

In answer to (*c*) 10 of the 20 firms found it impossible and meaningless to give a range over which the bulk of capital expenditure made. The remaining 10 firms replied as shown in the second table on p. 322:

Maximum level of capital expenditure (£'000)

10	10–15	15–25	25–30	30–50	50–100	100–150	150–250	250–500	500–750	750–1,000	1,000–2,000	2,000–3,000	3,000–5,000
1	2	1	1	2	3	1	1	1	1	2	1	—	2

Level of majority of capital expenditure (£)

1-2,000	2–3,000	5–6,000	6–7,000	10–15,000	15–30,000	50,000–100,000
1	1*	1	2	2	2†	1

* 40% of expenditure 2–3,000; 40% of expenditure 8–12,000.
† One firm 25,000–30,000.

Question 8 was 'What factors are the main consideration underlying your decision to replace?' Interviewees were requested to order the factors, i.e. 1, most important; 2, second important, etc. Three firms felt all the factors were applicable and were unable to grade them, of the remaining 17 the total of the ordering values was as follows:

(*a*) Physical deterioration of existing equipment	43
(*b*) Possible cost saving of replacing existing equipment by new equipment	29
(*c*) Change in final product	52
(*d*) Quality and technical improvement of latest new machines	46
	170

Information used and assessment made

Question 9 was 'Are decisions to replace machinery and equipment backed by written estimates of the probable saving in operating costs?' All the firms said they made written estimates of the probable savings in operating costs although in many cases this was subject to a minimum level of capital expenditure.

This question was further subdivided into:

(*a*) What makes up operating costs?

Response–

Maintenance	Labour direct and indirect	Cost of materials	Tooling	Scrap and Rework	Down time	Power	Floor Space	Property Insurance	Sub-contracting	Inventory	Safety	Machine Utilisation	Fuel
19	20	19	16	15	20	12	14	7	11	13	4	19	11

(*b*) How does flow of revenue and costs occur over time?

With regard to how flows occur over time, 19 companies took them on an annual basis and one company quarterly.

Question 10 was 'Where estimates of cost savings are made how are they related to capital outlay?' The list is reproduced below:

(*a*) Payback period.
(*b*) Accounting Rate of Return (annual savings as percentage of capital).
(*c*) Discounted Cash Flow (DCF).
(*d*) Machinery and Allied Products Institute method (MAPI).
(*e*) Optimal Replacement Method (ORM).

Response –

Payback	Accounting rate of return	DCF	MAPI	ORM
14	9	14	—	—

Question 11 was 'Whichever of the methods are used is the calculation computed with operating cost savings before or after accounting depreciation, before or after interest and before or after taxation, and on the capital cost side do you deduct the cash grant (under the old investment incentive scheme)?' The results are tabulated on p. 322:

The true cash flow assessment is:

Payback period=

$$\frac{\text{Capital Cost}-\text{Cash Grant}}{(\text{Operating Cost Saving}-\text{Interest})(1-\text{Tax})}$$

shown in the second table on p. 322.

The correct method for calculating the accounting rate of return is:

Accounting rate of return=

$$\frac{(\text{Operating Cost Savings}-\text{Accounting Depreciation})\times(1-\text{Tax})}{\text{Capital Cost}-\text{Cash Grant}}\times 100\%$$

shown in the third table on p. 322.

Question 12 was 'What is normal minimum figure required, on whichever of the above criteria is used?' The answer to this question can be misleading because of the different ways the results are calculated for the company concerned. It was, therefore, felt that these results should not be tabulated.

Payback

Capital cost	*Deduction of cash grant*	*Operating cost saving*	*Non-deduction of accounting depreciation*	*Deduction of interest*	*Deduction Tax*
14	8*	14	9	6	4

* One firm did the calculation both with and without deducting the cash grant and has been included in the figure incorporating deduction of the cash grant.

Accounting rate of return

Capital cost	*Deduction of cash grant*	*Operating cost savings*	*Deduction of accounting depreciation*	*Non-deduction of interest*	*Deduction of tax*
9	7*	9	8†	6	1

* One firm that did the calculation both with and without deducting the cash grant is grouped with firms that deducted the cash grant.

† One firm that did the calculation both with and without accounting depreciation is grouped with firms that deduct accounting depreciation.

Discounted cash flow

Capital cost	*Deduction of cash grant*	*Deduction of annual allowance tax savings*	*Annual operating cost savings*	*Deduction of tax*
14	13	12	14	12

Information that could be obtained

As it was clear from the answers to question 10 that firms did not consider the more sophisticated techniques in assessing a replacement problem it was decided to try and find out what sort of information they could provide.

Question 13 was 'Can you, or do you, estimate the output (revenue) for the old machine and new machine?' All companies said they both could and did.

Question 14 was 'Can you, or do you estimate the capital cost of the new machine?' Again all companies said they both could and did.

Question 15 was 'Can you, or do you estimate the operating cost of the new machine?' Again all companies said they both could and did.

Question 16 was 'Can you, or do you estimate the operating costs of the existing plant for next year or do you use the last year of operations operating costs for the comparison with the operating costs of new machines?'

Last year's	*Next year's*
14	5

One company did not have records of its operating costs or existing machines but worked out the operating cost savings of a new machine.

Question 17 was 'How far ahead can you estimate these costs and on what basis do you make this estimation on a replacement project?'

The responses are shown in the two tables at the top of p. 323.

Question 18 was 'If you bought a new machine next year instead of this year could you estimate how the capital cost and operating cost would be different from a new machine bought this year'?

Response –

New machine

Capital cost		*Operating costs*	
Yes	*No*	*Yes*	*No*
17	3	16[1]	4

[1] One firm said they could up to and including the freeze (of 1966-1968). One firm said they could with the exception of labour costs.

Question 19 was 'Similarly could you estimate how the operating cost of existing machine would have changed if kept for a further year?'

Yes	*No*
17	3

Question 20 was 'How many years ahead for considering purchase of a new machine could you do this for?'

The response is shown in the third table at the top of p. 323.

Question 21 was 'Are the concepts of deterioration and technical improvement meaningful?' All companies felt that qualitatively they were meaningful but to put a quantitative value to them was exceedingly difficult.

Question 22 was 'Is there a second hand market for your equipment?'

How far ahead

Impossible	*1 year*	*3 years*	*5 years*	*10 years*	*Over life of asset*
3	1	3	9*	1	3

* One firm felt they could estimate accurately for 1 year (although they could estimate for 5 years). One firm felt they could estimate accurately for 3 years (although they could estimate for 5 years).

Basis of estimation on replacement project

Keep savings constant	*Continuing past trends*	*Use of price index*	*Depends who does calculation*
11*	2†	3	4

* One firm made alterations for 'honeymoon' period.
† One firm made alterations for 'honeymoon' period.

Impossible	*1 year*	*1½ years*	*3 years*	*5 years*
10	1	1	5	3

The response to Question 22 was

Yes	*No*
8[1]	12

[1] Three companies said Yes for 'standard' equipment and No for 'special' equipment. One company said Yes for 'new' equipment and No for old equipment.

The question continued:

(*a*) If there is a second hand market for your equipment, what value (as percentage of initial capital cost) would you obtain from selling a one, two, three year, etc, old machine?

Of the eight companies who said there was a second hand market one company said 50–80 per cent after one year, 15 per cent after five years and another 80 per cent after one year, 50 per cent after five years. Of the remaining six companies, two companies said they would 'put the hammer through it' as it would be competitors who would buy the equipment, three companies said it was difficult to say as in practice they hadn't done it and the final company said there was a second hand market for their equipment because there was a delay in new machine production.

(*b*) If there is no second hand market for your equipment, what value (as percentage of initial capital cost), could you obtain by selling a piece of equipment as scrap?

Of the 12 companies who said there was no second hand market for their equipment all said they would obtain the value as scrap of their equipment.

Post audit procedures

It was felt that whatever method was used to arrive at a replacement decision it was necessary to find out how the estimates compared with the actual results, thus leading to improvements in future assessments. Question 23 was 'Do you conduct investigations to see whether replacements have lived up to expectations?'

Thirteen of the 20 companies had some form of post-audit procedure, three companies did not, three companies were incorporating a system and one company had a system but in practice didn't use it.

It was further asked how the estimated returns corresponded to the actual returns. The results are tabulated below for the 13 companies who had some procedure.

Generally tied up	*Estimates conservative*	*Widely scattered*
7	4	2

Capital expenditure and authorisation

Question 24 was 'Does the board set aside an agreed amount for replacement per annum?' Fifteen companies said No and five companies Yes. Of the five companies when asked how this amount was calculated three said it was related to accounting depreciation and two said it was calculated on past performance and areas of expansion.

Question 25 was 'Do you have a capital expenditure application and appraisal form?'

Capital expenditure application form	*Appraisal form*	*Appraisal done separately*
14	4	16

In the majority of cases blank capital expenditure forms were obtained and these were useful in comparing information from the replies used. Where there were appraisal forms these were also used in comparison with replies given.

Replacement and output/price relationship

Question 26 was 'If with a replacement machine cost per unit output decreases do you in anyway alter price?'

Yes	*No*
5	15

Question 27 was 'With deterioration of a machine do you produce same output (i.e. operating costs increase) or do you allow output to decrease?'

No answer	*Same output*	*Increase Output*	*Decrease Output*
6	8	2	4[1]

[1] One company had instances of both output decreased and maintained.

One company downgraded machine (accuracy, cost of materials price)·

Miscellaneous

As it is clear from the methods of appraisal that very little attention is paid to taxation it was decided to ask company representatives what they thought would be the effect of the change from cash grants to tax allowances and the reduction in Corporation Tax. Three of the firms did not answer the question. Of the remaining 17:

No advantages	*Fits in better with accounting function*	*Change in allowances – worse off*
3	5	4
Cash-wise we suffer	*DA worse off, NDA not so bad*	
3	2	

More detailed work has recently been carried out in connection with the potential effectiveness of investment incentives,[10, 11] and also on the importance of consideration of tax.[12]

Appendix II
The meaning of replacement

The term 'replacement' requires careful definition. In replacement theory the problem has been dealt with as that of a constant output cost minimisation model[9] solved traditionally by calculus. Although equipment replacement falls into the general category of capital expenditure decision making it has one characteristic which needs recognition in the analysis underlying decisions. This is the fact that retention of currently existing equipment is one of the alternatives. Decisions to replace come from two causes:

(i) Deterioration – through age the machine becomes less accurate, requires more maintenance and down time and thus either revenue decreases or operating costs increase.

(ii) Technical improvement – the latest type of machine via technological improvement is less costly to operate than a new machine bought several years ago.

The equation[9] to be minimised is of the form:

$$w = r\{ \int_{t=0}^{0} (E_0+\beta_0 t)e^{-rt}dt - S_0 e^{-rL_0}\} + w^1 e^{-rL}$$

where $w^1 =$

$t=0$

$$r \sum_{k=0} e^{-rkL}\{[E-\alpha(L_0+kL)+\beta t]e^{-rt}dt + W - Se^{-rL}\}$$

where E_0 = present or initial operating cost for the incumbent machine.

β_0 = rate at which the operating costs of currently employed equipment rise with age (linear).

S_0 = scrap value of incumbent machine.

L_0 = optimal life of incumbent equipment.

r = continuous discount rate.

E = initial operating costs of the best currently available model of new equipment.

α = rate of technical change

β = rate at which operating expenses of future machine replacements are expected to rise with age (linear).

S = scrap value of machines in the replacement chain.

W = capital cost of new machine in the replacement chain (constant).

L = optimal life of equipment in the replacement chain (equal lives).

Later works[3,8] have used discrete as opposed to continuous discounting and incorporated taxation and investment incentives. Nevertheless, there are very definite restrictions to the calculus approach mainly caused by the equal life of the replacement chain. This equal life assumption is necessary for a solution to be obtained by the use of calculus. Recently work[6] has been conducted showing that relaxation of the assumptions of constant capital cost of new equipment and linearity of both technological change and deterioration leads to unequal lives in the replacement chain and proposing that dynamic programming[13] is the technique to use in solving the replacement problem.

Theoretically consideration of the same output being produced is a severe straitjacket. In general replacement is concerned with changing output and therefore demand and price considerations must be incorporated in the analysis.

It is in this context, that of changing output, that replacement is viewed in this article.

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[10] H. H. Scholefield, 'Taxation Commentary: What has happened to Investment Incentives', *Journal of Business Finance*, Winter 1971, Vol. 3, No. 4.

[11] H. H. Scholefield and J. R. Franks, 'Investment Incentives and Regional Policy', *National Westminster Bank Quarterly Review*, Feb 1972.

[12] J. R. Franks and H. H. Scholefield, 'Corporate Problems in the evaluation of Projects', *Management Today*, May 1972.

[13] R. E. Belman and S. E. Dreyfus, *Applied Dynamic Programming*, Princeton University Press, Princeton.

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Inheritance Tax Studies

The prize-winning entries in the competition for articles on Inheritance Tax, financed by the P. D. Leake Committee were:

First prize (£250) R. M. Walters "An Inheritance Tax in the United Kingdom" published in **Accounting and Business Research** Number 8 Autumn 1972;

Second prize (£50) R. W. Maas "In Defence of Estate Duty" published in this issue, page 29.

Copies of these articles were made available to those attending the Conference on Inheritance Tax held at Chartered Accountants Hall on 16 November at which the Chancellor of the Exchequer was present. Further copies are available, price 25p each.

R. G. Leach Fund Award

The Trustees of the R. G. Leach Fund, who financed the original launching of **Accounting and Business Research,** have provided a prize of £100 for an article, on any subject, published in the Journal in 1972. The award will be in addition to the normal fee paid for articles in **Accounting and Business Research.** The prize-winning entry will be announced in the Spring 1973 issue.

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Depreciation and Business Decision-making

A. H. M. Bennett

I Introduction

Depreciation is generally understood to be a measure of asset value consumed over a period. This measure is set against gross value gains to determine the income for the period. The concept is similarly understood in the business firm, and in the national aggregates of macro-economic accounting. Yet there are remarkable disparities in the understanding of the nature of the concept and in its measurement. The business firm may adopt any one of a score of depreciation 'methods', resulting in a score of depreciation measures and a score of income measures.

Most users of income and capital data treat conventionally prepared asset statements with great reserve.[1] Lenders, guarantors and insurers look not at balance sheets but at their own valuers' certificates before accepting security or loss claims. Potential investors look, not at 'net worth' in the balance sheet, but at share prices in the market and weigh these against their private valuations. Fiscal authorities making income assessments substitute statutory capital consumption allowances for book depreciation. National income statisticians prefer to present gross data, such as gross domestic product, not because these are thought to be more relevant, but because of the known arbitrariness of micro-accounting depreciation quotas.

The debate has been considerably confused by the controversy over accounting for price-level changes. Businessmen have been quick to see that if depreciation quotas were raised in line with increases in asset prices, their book profits would be reduced, thus (?) reducing taxes. Over the last 30 years, while pressures have mounted against 'historical cost', various proposals have been put forward to make accounts more 'realistic'. Leading professional accounting institutions in the United Kingdom and Australia have recently declared their intention of reducing the multiplicity of accepted accounting conventions (and presumably unaccepted practices also) by recommending a standard treatment which would be used by all accountants, unless otherwise stated and for good reason. At the same time, uniform accounting has acquired a new topicality, partly due to proposals to harmonise regulations concerning company reporting in the various countries of the European Common Market, and partly from the need for greater reliability and consistency of data for planning economic development, in the richer countries as well as the poorer.

Yet academics are more worried than pleased with this sudden concern. They have become aware that accounting is a branch of information theory, that the objectives of accounting have not been established and that before this can be done, the users of accounts must be identified, their decision-models examined, and their informational needs defined. 'An understanding of who uses accounting reports and for what purposes is a necessary pre-requisite to sensitive reporting'.[2] It is also, it may be added, a pre-requisite to a more relevant theory of accounting.

This article is intended to widen the conceptual framework of accountants and to warn against premature 'standardisation'. It may also help economists who berate accountants for their failure to adopt 'logical' depreciation theories by introducing them to some of the neglected variables. The article reviews briefly the general requirements of data for decision-making (Section II) and specific data requirements for various classes of decision (Section III). It then considers some possible value/depreciation concepts against these criteria in an attempt to clarify the theoretical and practical issues involved (Section IV), and possible modifications to accounting practice, the climate for such change, and suggestions for further research (Section V).

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[1] See, e.g. 'Security Analysts and the Price Level', *Accounting Review*, October 1955, pp. 576–77.

[2] Morton Backer, 'Accounting Theory and Multiple Reporting Objectives', in *Modern Accounting Theory*, ed. Morton Backer (Prentice-Hall, 1966), p. 448.

II General requirements of data for decision-making

Data should be relevant and timely to the decision. Data should carry the greatest possible significance, e.g. exception data are better than complete data, future data better than past data. Data should be accurate (though they need only be sufficiently accurate that the error would not alter the decision: any greater accuracy is redundant).

These general maxims of management control systems conceal a number of problems, such as the operational meaning of 'relevance' and 'significance', and related concepts such as 'utility' and 'materiality'. These problems are compounded when data serve different purposes. For instance:

(i) is the profit for a period as calculated by accounting conventions strictly relevant to the period if it excludes unrealised profits which have accrued during that period?

(ii) is profit data relevant if it is not matched with risk and illiquidity?

(iii) what is the significance of charging straight line depreciation (an equal amount each year) on an asset generating diminishing returns, as is commonly done?

Relevance was defined by Chambers[3] as 'the property by virtue of which a statement, singular or aggregative, has potential for selecting responses in an actor at a point in time'. Chambers points out that this demands a knowledge of (*a*) the identity of decision makers; (*b*) the environment in which their decisions and actions are made, and (*c*) the type of decisions and actions they may make.

A distinction should be made between *actual* relevance, which depends upon the actor, and *normative* relevance, which depends on the person stating the norm. Thus, accounting information may be inappropriate or used inappropriately by an actor, due to his ignorance or mis-interpretation or irrationality, yet it must still be classed as actually relevant if it assisted in determining his response. The person who says that the information is used inappropriately, etc., is applying a standard of normative relevance.

A related criterion which has been much emphasised by the accounting and auditing profession is objectivity. Those who prepare data and those who use data may have different aims and purposes. In such a case, data must be objective in the auditor's sense that it should be verifiable by means of evidence existing independently of the observer.

A further general criterion is that the cost of processing data should be minimised and in any case the incremental cost should not exceed the incremental decision-making value. The value is often non-quantifiable and, in consequence, large amounts of data are prepared which are probably not justifiable. Nevertheless, the criterion makes sense. In a choice between, say, alternative concepts of depreciation neither of which carry any decision-making value, the concept which is easier and cheaper to apply would be preferred.

III Data requirements for various classes of decision

Three broad classes of decision use depreciation data – decisions on resource allocation, income distribution, and consumption.

(*a*) According to discounted cash flow theory, a profit-maximising firm invests (allocates resources) when the present value of expected returns exceeds the present value of resource opportunity costs, discounting at the firm's opportunity cost of capital.

This cash flow calculus does not involve any depreciation estimates in the usual case in which the investment is evaluated for its entire life.

However, investments are still widely evaluated on annual rate of return calculations which incorporate depreciation estimates both in the profit numerator and capital denominator. In the more industrialised countries rate of return on capital is in widespread use as a primary indicator of management efficiency.[4] This is most often true in the case of continuing investments. Subsidiary companies, divisions, product lines, service facilities, and other resource using units may be expanded, contracted or closed down following an evaluation of their profit potential based on reported profits, and/or the ratio of reported profits to some assets or sales revenue base.

Resource allocation decisions which are influenced by or a function of past profits include not only direct resource allocations (expansion, diversification, modernisation, etc.) but also allocations of authority over resources such as are implied in the capital market, or within enterprises, by which managers who have demonstrated adequate profit performance obtain the use of funds, budget authorisations, etc.

Resource allocation decisions are made mainly by the following users of accounting information:

(i) owners (proprietors, partners, shareholders), both present and prospective, and their agents (managers, public administrators, security analysts);

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[3] Chambers, R. J. *Accounting, Evaluation and Economic Behaviour*, p. 164.

[4] Solomons, D. *Divisional Performance: Measurement and Control* (Irwin 1965), p. 123.

(ii) lenders (suppliers, bankers, debenture – and bond-holders), both present and prospective, and their agents (managers, public administrators, security analysts, credit intelligence agencies);

(iii) employees, present and prospective, who allocate their manpower to owners.

The main difference between these categories is one of risk, or rather uncertainty, as distinguished by Knight.[5] Lenders and employees get a contractual payment. Owners, on the other hand, bear the uncertainty whether the returns from an allocation decision will, as expected, exceed all contractual payments. If they do, the excess is profit and constitutes their income.

Lenders and employees also face uncertainty in their decisions to allocate resources to owners. This uncertainty is at a considerably lower level, but is biased against them, i.e. they can fail to be paid, but cannot receive more than contracted (if changes in the value of money are ignored).

What data has normative relevance to *present* owners? (if we leave aside the factual problem of actual relevance which has not been sufficiently researched). Present owners have to decide on the disposition of their assets.

If an asset is held, a decision may be made on its internal use, if it has alternative uses, or to sell it, if there is a market, and to use the proceeds in some other way. Use in project A rather than in project B (ignoring risk differences) depends on the superiority of the expected future returns in A (net of other inputs) over those in B. The decision to sell depends on the superiority of expected returns from the reinvested proceeds over the highest returns in any internal use. In each case the decision-maker has to value alternative sets of expected returns, and choose the higher. Yet the decision to sell requires in addition an estimate of the asset's proceeds. This latter is the asset's net realisable value, a version of market value which will be discussed below.

A *prospective* owner is faced with the decision whether to acquire an asset. The acquisition decision depends, as stated above, on the superiority of expected returns (the highest returns from alternative uses) over the returns from investing the acquisition cost in some other way. Again, the choice lies between alternative valuations by the decision-maker, but a component factor in the acquisition alternative is the acquisition cost. This is another market based value, also to be discussed below.

Essentially, the same decision is required for purchases and sales of securities as for purchases and sales of assets.

The decision to lend rests also upon the same basic decision model as the decision to participate in ownership, though differences in the level and type of uncertainty (e.g. liquidity uncertainties as opposed to profitability uncertainties) may obscure their formal similarity.

(*b*) Distributional decisions are also influenced or determined by depreciation data, via income and capital determinations. These decisions are made mainly by negotiation between the managers of firms and the following classes of participant, all of whom may use accounting information in their negotiations:

(i) owners. Dividend distributions out of income are of course limited by statute. In most countries current profits, plus (usually) retained past profits, form an upper limit to dividend distributions: excess distribution would be an illegal repayment of capital;

(ii) government. Tax and subsidy assessments are distributional decisions, though many fiscal authorities do not accept reported depreciation data and replace them with statutory capital consumption allowances, as mentioned above;

(iii) employees and their agents (unions, government regulatory bodies) may receive remuneration varying with profits, either directly by the operation of labour and management incentive pay schemes, or indirectly by the use of profit data as an indicator of ability to meet pay claims;

(iv) customers, who lose or gain real income by higher or lower selling prices.

Distributional decisions are more dependent on ethical, socio-political and institutional considerations than allocation decisions. In the absence of distributional norms, it is not possible to state what data would have normative relevance.

(*c*) Consumption decisions may be mentioned briefly. 'Living within one's income' is a familiar consumption standard. According to Hicks[6] *the* practical purpose of income calculations is 'to give people an indication of the amount they can consume without impoverishing themselves'. Hicks believed that only ex ante (expected) income guided consumption decisions, though it is apparent (if only from introspection) that a good deal of consumption behaviour is influenced as much or more by past income as by prospective income, despite the fact that 'bygones are forever bygones'.

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[5] Knight, F. *Risk, Uncertainty and Profit* (Boston, 1921).

[6] Hicks, J. R. *Value and Capital,* Oxford 1946, 2nd ed., p. 172.

IV Asset valuation and depreciation concepts

Depreciation theories may be divided into five categories:

- A traditional accounting theory which seeks to match the capital cost of an asset with the net revenues to which it gives rise.
- B theories based on discounting expected net revenues from the asset.
- C theories which aim at stabilising net earnings after depreciation.
- D opportunity value theory.
- E theories based on market values.

These will be discussed below. Appendix 1 is a mathematical treatment of opportunity value theory. Appendix 2 outlines the effect of inflation (increase in the general price level) and may be read in conjunction with any of the above theories.

A Traditional accounting theory

Depreciation for accountants has been a highly practical problem, probably since the development of highly capitalised factory production. It was not at first recognised that income should be reduced by some measure of asset consumption: for the first thirty-six years after Peel had re-introduced the income tax in Britain in 1842, no relief was given by the British tax code for the using up of fixed assets in the course of carrying on a business. It was argued that depreciation was an optional item. If a firm wanted to allow for depreciation in assessing its profit, it could do so, but this was entirely a matter between the firm and its owners. A well-known series of legal cases in the United Kingdom endorsed this laissez-faire point of view.

However economic and administrative arguments prevailed in practice. The economic argument was that the value in a capital asset flowed into production in the same way as, for instance, the value in a stock of raw materials; the profit could not be called a true surplus until this had been allowed for. The fact that raw material value flows visibly, and fixed asset value flows invisibly, does not alter the argument.

The administrative argument was directed towards consistency. It is obviously far better for everyone – prospective shareholders as well as existing shareholders, creditors, employees and their unions, government departments, and management itself – if profit always means 'net of depreciation'.

The debate was carried on entirely by accountants, as the economists of that time – Mill, Gossen, Jevons, Walras, *et alia* – while recognising the fact of depreciation, did not suggest any precise operational rules for its determination.[7] Probably the first paper by an accountant on the subject was published in 1876.[8] The main pre-occupation of these early writers was to avoid the risk of paying dividends out of capital, since capital was subscribed on the basis that it would be maintained.[9] By the end of the 19th century it was well established that depreciation was a proper charge against profit, irrespective (i) of whether the profit could bear it, (ii) of whether the asset was expected to be replaced by a similar asset, and (iii) of the adequacy of maintenance. This victory for sound financial accounting, still celebrated in the leading textbooks today, was the start of a long and complicated argument as to *how much* depreciation should be charged in each year. Several methods of charging depreciation were developed and vigorously propounded, counter-attacked and defended.

It was evident that profit was the result of buying factor inputs at low prices and converting them to goods and service outputs at high prices. The problem arose on inputs which were used over a long period, i.e. attributable to the output of more than one accounting period. The 'matching rule' required that the cost of such an input (net of any residual scrap value) be allocated to the benefiting periods.

In other words, capital expenditure is a *joint cost* to the years that benefit. If an account were prepared to cover the entire life of an asset, there would be no problem: the entire cost of the asset would be charged. The problem arises only when we wish to know the depreciation and profit in each year. In total they are certain, but the allocation is arbitrary: some years may be too high, and other years too low, but they even out over the whole period.

Though there were early attempts at revaluing assets (i.e. in line with market values) the practice did not become general for four reasons:

(i) fixed assets were not held for sale, so their market values were held to be irrelevant;
(ii) for current assets such as stocks, it was thought to be imprudent to value them at their market values where these had risen above their cost to the firm, since this would have the effect

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[7] Despite the interest of (mainly German) writers in definitions of personal income for tax purposes.

[8] Quoted by Brief, R. P., in 'Depreciation Theory in Historical Perspective', *The Accountant*, 26 November 1970, p. 737.

[9] An exception has always been allowed for companies formed to exploit mines, oil wells, quarries or similar assets of a wasting character where shareholders understand that the company will wind up when the asset is exhausted and that their dividends include a return of capital.

of increasing profit in the accounts before it had been realised, i.e. before it had been validated by a legally enforceable contract of sale;

(iii) it is usually difficult and expensive to get a professional revaluation of assets every year (this is usually done only on the purchase or amalgamation of a firm); and

(iv) some specialised assets have no second-hand values – to write them down to their scrap value in the year of purchase would distort annual profit comparisons.

Therefore, the accounting profession abandoned the revaluation basis.[10] In its place, it allowed any method which allocated the historic cost over the benefiting years in 'a systematic and rational manner', i.e. the basis for charging depreciation must be determined at the time of purchase, and then applied consistently from year to year. Great emphasis is thus placed on inter-period comparison, but because different firms may use different methods, [11, 12] inter-firm comparison is not facilitated.

Since the straight line method has been officially recommended, and is widely used, we will consider how this method meets the decision-making criteria. Other 'acceptable' methods will be mentioned only in passing.

(i) *Relevance*

Before considering the relevance of cost-based depreciation for judging the performance of an enterprise, it is necessary to discuss the general rule of maintaining assets at cost until they are sold.[13] This historic cost doctrine is deeply entrenched, otherwise it would not have survived such incessant attack.

The attack has been on five fronts. *First*, a business exists to make profit, and an owner appreciates capital profits as much as operating profits. The former should not be excluded merely because they are unplanned (and why should they not be planned?) nor because they are less likely to recur than operating profits. The different kinds of profit should of course be distinguished for predictive purposes if they are not equally likely to recur.[14] Similarly, realised profits should be distinguished from unrealised profits and real profits should be distinguished from apparent monetary profits (see Appendix 2 on the impact of inflation). *Second*, capital profits should be brought into the accounts as they occur over the periods affected, not in a lump in the period of realisation, in order that profits may properly be matched with the risks and illiquidity suffered during the periods concerned. At present, accounting profit is not matched with the risks of earning it. Two firms may show the same profit, but one may have substantial gains about to be realised. *Third*, omitting capital gains until they happen to be realised introduces a capricious element into profit and invalidates comparisons. *Fourth*, the 'going concern' principle (i.e. the expectation that the firm will not be liquidated at the end of the year, but will continue in business) does not imply the valuation of assets at cost.[15] Nor does continuity exclude any other basis of valuation. It does not, for instance, exclude a market basis of valuation on grounds other than impending sale, such as the need to match income with risk and illiquidity. Nor, even, does continuity of the firm imply continuity in holding any particular asset. In fact, profit maximisation implies the reverse: when the market value of an asset exceeds its discounted present value to the firm it should be sold, irrespective of its age, or how recently it was purchased. The going concern concept may better be taken to mean that if market prices are used for valuation, these should be prices obtainable in the normal course of business, not on a forced realisation. *Fifth* and last, profit measurement has nothing to do with the availability of cash for dividend distributions. Dividend policy depends on a number of quite separate factors.

We will now by-pass this argument by assuming that the prices of fixed assets remain constant, and go on to consider the significance of straight-line depreciation.

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[10] Except for small short-life assets such as loose tools, jigs and patterns, for which cost allocation methods are impracticable.

[11] Though a variety of methods are allowed, the Institute of Chartered Accountants (England and Wales) has recommended (N9, 1945) the use of the straight line method, except for goodwill and freehold land (which do not generally depreciate), loose tools (revaluation), and wasting assets (depletion unit method).

[12] Accepted methods in the UK and Commonwealth countries include straight line (fixed instalment), reducing instalment, annuity, sinking fund, repairs and renewals, machine-hour rate, and depletion unit methods. In the US, under the influence of tax legislation, the sum-of-digits, and double-declining balance methods have also become accepted. For explanations of these methods, any textbook on financial accounting may be consulted, e.g. Spicer and Pegler's *Book-keeping and Accounts*, Bierman, H. *Financial and Managerial Accounting* (Macmillan, 1963).

[13] An exception is made for work in progress on long-term contracts: profit is calculated on a conservative basis and admitted during the period of the contract.

[14] On the separate reporting of 'holding gains' and 'operating gains', see Edwards, E. O. and Bell, P. W., *The Theory and Measurement of Business Income* (California, 1961), pp. 223/232.

[15] For a contrary view, see Backer, M. 'The Measurement of Business Income – Part I. The Matching Concept', in *Modern Accounting Theory* (Prentice-Hall, 1966), p. 72.

The asset is shown in the balance sheet at cost, reduced by accumulated depreciation. The net cost remaining on the books is often called a 'net book value', but it is evidently not the value to the firm in any sense, nor the value to a shareholder. It is becoming more generally understood – at least amongst accountants – that this figure is quite irrelevant for all economic purposes such as whether to sell the asset, or replace it, how much to insure it for, its transfer price to a subsidiary, its value for litigation purposes, etc. Similarly, the total of all assets in a balance sheet has no relationship with their value, or the value of the shares. The 'man in the street' may be pardoned for thinking that the balance sheet is at least an approximate indication of value,[16] especially when accountants use terms like 'net worth' (US) and 'book value' and auditors swear that a 'true and fair view' is shown. However, the man in the street is wrong, and it is time that accountants purged their cost-based statements of value-suggestive terms.

There are many stories of how economic behaviour is affected by such mis-description, but one will suffice. A firm had two accounting machines, of different ages, but identical in their functions and in complete working order. Accidentally, one fell down a stair-well and was smashed. The managing director was very worried, until he heard that it had already been written down to nil. 'Thank God', he said, 'that it was not the other one'.

The effect of straight-line depreciation on profit is not so well known. Most tangible assets have increasing repair costs and declining productivity over their lives. Since the same amount of depreciation is charged each year, reduced revenue and higher operating costs have the effect of reducing profits, though management are no less efficient than before. The decline in profits may even conceal an increase in efficiency. (This may be contrasted with profit-stabilising theories of depreciation in (*c*) below). Conversely, some of the accelerated depreciation methods such as declining balance, double-declining balance, and sum-of-digits, over-correct for declining cash flows, and give a picture of increasing profits and efficiency. This can be very misleading, not only in inter-period comparisons, but also in inter-firm (or inter-project, -division, or -industry) comparisons where the age structures of assets differ.

Another shortcoming is that straight-line depreciation is constant even though an asset may be worked more or less intensively. Cost cannot be said to be matched with revenue if the same depreciation is charged, say, on a single-shift machine as on a treble-shift machine. This is sometimes avoided by adopting a use-related method of depreciation such as machine-hour rate, or depletion unit. However, this is not wholly satisfactory as machines lose value even when they are not used. This is especially true of assets subject to rapid obsolescence. Assets are sometimes categorised as time-assets and use-assets, depending on whether their market values decline with the passage of time (e.g. a patent) or with use (e.g. an oil well). However most assets are both time-assets *and* use-assets. Their value declines with obsolescence (of the machine and of its product) *and* with wear and tear from use. The straight-line method is least inappropriate for time-assets that are well maintained.

A related illusion is the apparent increase in profitability (return on capital employed) when the same annual profit is divided by a decreasing asset base (net book value). Du Pont, for example, one of the pioneers in the use of rate of return analysis, ignore depreciation and count assets employed at cost.

The answer to this conundrum is that, however depreciation is charged, equivalent assets are retained so that, except for retained profits or new capital, total assets are constant. This will be further discussed in (*c*) below.

For resource allocation decisions within the firm, straight-line depreciation is almost always inappropriate. The appropriate cost is *user depreciation*, that is, the extra depreciation that is incurred by use. A machine should be allocated to the use which generates the highest returns, net of user depreciation and all other opportunity costs.[17]

(ii) *Objectivity*

Straight-line depreciation is estimated from three factors – historic cost, effective life, and scrap value. At the time that depreciation should be estimated,[18] the cost is usually a known fact, though constructed assets, jointly purchased assets, and assets acquired in exchange for shares, may raise problems.

The effective life of the asset depends on a number of factors, including the expected patterns of operation and maintenance. Even if a standard pattern were assumed, the estimated life of an asset may vary considerably from one person to another. In the US, researchers asked 134 certified public accountants by questionnaire how they would depreciate a 10-key Monroe printing calculator. The major variation in their answers was in the expected life, which ranged from three years to twenty years.[19]

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[16] The post-war wave of take-over bids in the UK was one result of this, assisted by the conservative accounting practice of over-stating depreciation and under-stating assets: in effect shareholders did not appreciate the true value of their companies and were easily cheated.

[17] User cost, like all other opportunity costs, depends on the practicable alternatives open at the time of decision, and should not be equated with use-related methods of depreciation (i.e. pre-determined rates). For a discussion of this point, see Solomons, D. 'Economic and Accounting Concepts of Cost and Value', in *Modern Accounting Theory*, ed. Backer, M. (Prentice-Hall, 1966), pp. 133–6.

Similarly, the scrap, salvage or sale value is very much an estimate.

If accountants, amongst whom a measure of professional agreement may have been expected, differ so markedly on the correct straight-line charge for depreciation, the method can hardly be claimed to be objective, except in comparison with an even less objective method.

(iii) *Administrative convenience*

The straight-line method is arithmetically simple, once the three initial factors have been determined. It is necessary to keep a separate record of each asset, since on disposal its original cost and accumulated depreciation must be removed from the balance sheet. However this inventory record is usually kept in any case for purposes of internal control, and the additional labour of recording the above data is not very significant.

B Discounted revenue theory

The subjective economists[20] defined value-in-use of an asset as equal to the sum of expected net cash flows, discounted at the interest cost of capital.[21] Market value was believed to be derived from such subjective valuations of individuals.

The net cash flows referred to are those attributable to ownership of the asset. Just as capital budgeting considers the incremental cash flows that are expected to arise if an asset is purchased, so an already-owned asset may be valued by reference to the decrement in cash flows if it were lost.

While this is entirely valid for a defined asset, the present value thus obtained is not necessarily additive to present values of other assets. Where assets are used jointly the whole of the receipts (or a large part) may be attributable to each asset in turn and the sum of the separate asset values may be many times greater than their joint value.[22] It is evident that the sum of separate asset values will depend upon the definition of 'separate asset'. In the extreme case, each cog in a machine may be valued on the whole of the machine's product since each cog is necessary to the operation of the machine.

It appears, therefore, that the capital budgeting approach provides a valuation concept which is relevant only to the marginal or incremental asset or group of assets: assets used jointly can only be valued jointly. Similarly, if depreciation is defined in terms of the decline in present value, this is depreciation on the incremental asset and the sum of separate depreciation quotas has no validity. This will not, of course, concern the single asset firm or the firm in which each asset, however defined, is worked separately and independently of the others, but these are special cases.

It has been argued that the present value of an asset must be equal to its cost, as a firm would go on purchasing such assets until they *were* equal. However, for infra-marginal assets and large indivisible assets, present value may exceed cost. Preinreich[23] drew attention to this inequality. 'Market price oscillates around a balancing point determined marginally by the least efficient pair of all producers and all consumers of such machines. In the general case, therefore, capital value is apt to be greater than cost.'

This occurs, of course, when cash flows are discounted at the firm's cost of capital (opportunity cost) and the asset acquisition is intra-marginal. This implies that the asset is brought into the books at above cost. The excess over cost has been called 'net present value', 'subjective goodwill' or 'unrealised profit' and some writers have suggested that it be credited to a reserve account, and released into the profit and loss account over the life of the asset.[24]

Needless to say, the idea of an instant profit on purchase – even if it is distinctly labelled 'unrealised' – has not been universally approved. The conservatism of the accounting profession need not be cited, as a more fundamental objection was raised by the opportunity value theorists (see (*c*) below) who asked how an asset could have a value higher than the cost to the firm of replacing it. On the principle that the

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[18] i.e. on acquisition of the asset – not at the end of the year, when the choice of method may be influenced by the desired profit picture.

[19] Article in *Accountancy*, July 1970, pp. 508–513.

[20] e.g. Irving Fisher, Hicks, J. R.

[21] Fisher, I. *The Nature of Capital and Income* (New York, 1906), p. 189.

[22] This may be contrasted with goodwill – the excess of joint values over the sum of separate market values.

[23] Preinreich, G. A. D. 'Annual Survey of Economic Theory: The Theory of Depreciation', *Econometrica* 6 (July 1938), p. 234.

[24] e.g. Bierman H. Jnr., 'Depreciable Assets – Timing of Expense Recognition', *Accounting Review* XXXVI (October 1961), p. 616.

value of something is the loss resulting from not having it, an upper limit on value is set by the replacement cost of an identical asset.

One way of avoiding an initial valuation at above cost is to value an asset on its future services discounted at the *internal rate of return.* Edwards and Bell[25] say that depreciating an asset on its internal rate of return gives book values which correspond to market values provided transport and installation charges are ignored and if the asset has a single use, and all users are equally efficient. 'Arbitrage between the new machine and used machine markets would tend to bring the market values into conformity with the computed book values'. They admit, however, that such valuation is subjective in nature (like all discounted revenue theory) and that all users are not equally efficient. If a firm is less efficient, its internal rate of return will be lower than in other firms, and initial depreciation would be more than the fall in market value. Preinreich's comment applies.

(i) *Relevance*

If an asset is depreciated according to the decline in its present value, discounting at the opportunity cost of capital, and assuming the asset is brought into the books at its initial present value (above cost), *net profit is equal each year,* provided actual cash flows correspond with expectations, and provided the assets retained on account of depreciation earn profits equal to the opportunity cost of capital (see Table 1).

Therefore, any variation in the profit from year to year must be due to variations from the original expectations on which the depreciation pattern was based, both as to expected cash flows and the expected rate of return on retained depreciation assets.

This concept of depreciation, therefore, provides 'exception' information which would be of value to management. (The same applies to revisions of expectations and of the depreciation pattern during the life of the asset: these give rise to revised equalised profits).

It should also be noted that *profitability* is also equated from year to year. It can be seen from Table 1 that profitability is equal to the opportunity cost of capital in each year, and that this is true for the

primary asset $$\left(\frac{11{\cdot}99}{119{\cdot}98}=\frac{6{\cdot}21}{61{\cdot}97}=\frac{1{\cdot}82}{18{\cdot}18}=10\%\right)$$

as well as for

total assets $$\left(\frac{11{\cdot}99}{119{\cdot}98}=\frac{12{\cdot}01}{119{\cdot}98}=\frac{12{\cdot}00}{119{\cdot}98}=10\%\right).$$

These conclusions hold also in the multi-project firm.

Since this is a pre-determined pattern of depreciation, based on the expected pattern of use, variations in the pattern of use cause variations in profit rather than variations in depreciation. Therefore this theory does not provide relevant cost data for resource allocation decisions within the firm.

As for the book values provided, these will have decision-making relevance. If the book value falls below the present value in any alternative use, the asset should be switched to its alternative use. Similarly, if the book value falls below the net realisable value (or, more strictly, below the present value from reinvesting the sale proceeds) it should be sold. The book value will not – at least initially –

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[25] Op. cit., p. 177

TABLE 1

Profit and loss account	T_0	T_1	T_2	T_3	*Total*
Net cash flow (expected and actual)		70	50	20	140
Less depreciation of present value discounting at 10%		58·01	43·79	18·18	119·98
Net profit on primary asset		11·99	6·21	1·82	20·02
Add net profit on depreciation assets (assumed to be 10% p.a.)		—	5·80	10·18	15·98
Net profit on total assets*		11·99	12·01	12·00	36·00
Balance sheet					
Primary asset (cost 100, PV on purchase 119·98)	119·98	119·98	119·98	119·98	
Less accumulated depreciation	—	58·01	101·80	119·98	
Book value of primary asset	119·98	61·97	18·18	—	
Depreciation assets	—	58·01	101·80	119·98	
Total assets (=equity)	119·98	119·98	119·98	119·98	

**Difference on rounding.*

represent the value for which the asset should be insured, or the transfer price to a subsidiary. Nor will the sum of such book values have any relevance for valuing the firm, its shares, or its goodwill, for the reason mentioned above.

If valuation is based on future cash flows discounted at the internal rate of return, but depreciation assets earn profits equal to the opportunity cost of capital, annual profits decline year by year (see Table 2).

If depreciation assets earned the same rate of return as the primary asset, (23·5%), net profit on total assets would then be constant from year to year (as when discounting at the opportunity cost of capital). However this would hold only if the primary assets were a marginal investment.

It will be observed, though, that the primary asset shows a constant profitability equal to its internal rate of return $\left(\frac{23\cdot6}{100}=\frac{12\cdot6}{53\cdot6}=\frac{3\cdot8}{16\cdot2}=23\cdot5\%\right)$. This may be expected from the definition of the internal rate of return as the highest rate of interest payable on the capital outstanding in the project. Thus, the method provides exception information when the firm keeps separate project accounts. Unfortunately, this is not generally true except for large projects which may conveniently be hived off as separate divisions, subsidiaries, branches, etc., i.e. as separate accounting entities.

The same comments as before apply regarding the irrelevance of this depreciation cost in resource allocation decisions, such as whether to expand or contract production of any particular product, whether to make a required item or buy it, whether to process an item further or sell it as it is, etc.

Similarly, the book value of the asset cannot be described as its market value or its value to the firm except at the time of purchase.

(ii) *Objectivity*

Expectations of cash flows and of the cost of capital are those of the valuer, i.e. the valuation is personal to him. Every item entering into the determination of present value relates to the future. Estimates of future returns, future operating costs, future taxes and future cost of capital cannot, except in a state of perfect knowledge not yet found in practice, be verified by others.[26]

Therefore, asset valuation by discounted revenue theory remains a private assessment, subject to private motivations, unchecked by public evidence. The same flaw applies to differences between valuations (i.e. to depreciation), and to income determinations net of such depreciation.

This does not mean that present values should not be calculated, or that they may not be used by the valuer or by others, only that reliance on such values is in fact reliance on the valuer.

(iii) *Administrative convenience*

If a firm prepares a discounted cash flow evaluation of an asset before deciding to purchase it, it can easily prepare a schedule of depreciation, year by year, which can be applied without any further calculation.

The method is inconvenient only when asset valuations are made each year on revised expectations,

TABLE 2

Profit and loss account	T_0	T_1	T_2	T_3	*Total*
Net cash flow (expected and actual)		70	50	20	140
Less depreciation of present value, discounting at the internal rate of return		46·4	37·4	16·2	100
Net profit on primary asset		23·6	12·6	3·8	40
Add net profit on depreciation assets (assumed to be 10% p.a.)		—	4·6	8·4	13
Net profit on total assets		23·6	17·2	12·2	53
Balance sheet					
Primary asset (cost 100, IROR=23·5%)	100	100	100	100	
Less accumulated depreciation	—	46·4	83·8	100	
Book value of primary asset	100	53·6	16·2	—	
Depreciation assets	—	46·4	83·8	100	
Total assets (=equity)	100	100	100	100	

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[26] A valuation might be accepted as objective if all private valuations coincided, at least within the limits imposed by necessary approximation in measurement.

since the labour of forecasting an asset's remaining cash flows may be very heavy. Present values require careful forecasts of incremental sales, costs, and taxes. Anyone who has been concerned in capital expenditure evaluation knows the co-ordinated effort involved in such projections.

C Stabilised earnings theories

The matching rule requires that costs be matched with benefits. If the benefits are constant, or near-constant, each year, one would expect the same cost to be charged each year.

This is sometimes used to justify straight-line depreciation since this palpably produces the same 'cost' each year. Similarly, the so-called repairs and renewals method, which charges an equal amount each year based on the total cost and expected lifetime repairs, is intended to even out low repair costs in earlier years, and higher repair costs in later years.

More sophisticated 'stabilised cost' methods are the annuity and sinking fund methods, which stabilise the net effect on the profit and loss account of depreciation and interest on the capital value outstanding. Since interest on the book value decreases, depreciation increases correspondingly. The annuity method, which retains depreciation assets within the firm, has been described as *the* correct depreciation method.[27]

However, it cannot be correct when cash flows vary, and are expected to vary. A more comprehensive basis equalises the aggregate of repairs and other operating costs, and changes in productivity, as well as depreciation and interest on capital.[28] In effect, depreciation is made the balancing item which equates the net profit (ex ante) from an asset each year. This will be called 'Ladelle depreciation'.

At first sight, such a depreciation schedule would appear quite irregular, but it may be defended on the ground of rationality. If a managing director purchases an asset on which he expects a return over life of 10 per cent. per annum, and cash flows accrue as expected, it is not rational to show high profits in one year and losses in another, merely on an arbitrary allocation of depreciation. It is more rational, and there would be less risk of abandoning a project after a 'bad' year, if total expected profits were smoothed by a suitable allocation of depreciation.

This system of depreciation has a market analogy. Arbitrage between new and second-hand markets for an asset may be expected to equalise the total costs of holding and operating an asset in each year. If the cost of operating an asset became heavier in its later years, for instance, there would be fewer buyers of old assets and their buying price would drop, reducing depreciation, until operating costs plus depreciation plus interest were again equal to the costs of newer assets. If productivity varied with age, net revenue would be equated rather than costs.

However, this system as proposed by Ladelle was based on the expectations of the firm at the time of purchase, not on market expectations, even if these were discoverable. Ladelle depreciation does not maintain assets at their market values.

Ladelle saw the problem in terms of a group of speculators who purchase the asset with each person being assigned the expected benefits for a particular year. For these uncertain benefits they must jointly agree on the proportion of the original cost that each must pay. An important proviso, which will be relaxed later, is that the benefits to each speculator should be independent of the actions of any other speculator.

Let us assume the same deteriorating asset with initial cost 100, for which the agreed schedule of benefits is 70, 50, 20 in successive years. (This may represent declining productivity and/or mounting operating costs). If the cost of capital to all three speculators is 10 per cent. per annum the initial cost will be divided between them in the proportions 51·9, 37·2, and 10·9 so that each speculator expects the same net benefit as follows:

	1st Speculator (assigned benefit from year 1)	*2nd Speculator (assigned benefit from year 2)*	*3rd Speculator (assigned benefit from year 3)*
Purchase price	100	48·1	10·9
Selling price to next speculator	48·1	10·9	—
Depreciation cost	51·9	37·2	10·9
Interest on purchase price for 1 year at 10%	10·0	4·8	1·1
Capital costs	61·9	42·0	12·0
Benefit	70	50	20
Net benefit	8·1*	8·0	8·0

* Difference on rounding.

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[27] See Anthony, R. N., *et al, Management Control Systems: Cases and Readings* (Irwin), p. 343; Solomons, D., *Divisional Performance: Measurement and Control,* p. 135.

[28] Put forward as long ago as 1890. See Ladelle, O. G., 'The Calculation of Depreciation', *The Accountant,* 29 November and 6 December 1890, reprinted and commented on by Professor Brief in *Journal of Accounting Research,* Spring 1967, p. 28. See also Dewey, D., *The Theory of Imperfect Competition* (New York, 1969), pp. 146–7.

Each speculator bears the risk attaching to his own year's benefits. Risks may be thought proportionate to unrecovered capital (i.e. higher in earlier years), or increasing as a function of time (i.e. higher in later years) or variable in other ways. If it were thought that risks were unequal from year to year, then either net benefits could be made proportionate to risks, or gross benefits could be discounted according to risk, i.e. some sort of expected value could be substituted for gross benefits.

Actual benefits will of course differ from expectation, and expectations of remaining benefits will change. The important point to note is that this would not affect the contracted share of depreciation cost. Increases and decreases in benefits will advantage and disadvantage the respective speculators (years) but they continue to bear depreciation as agreed at the outset. This has implications for the information value of depreciation and other cost and profit data since the exception principle applies; variations in net profit will be due entirely to differences between expected and actual costs and benefits (see below).

An important feature of the Ladelle theory is that though the market analogy is used to allocate depreciation cost, this is done entirely in terms of the firm's expectations at the point of purchase. The firm makes its own projection of costs and benefits and this is presumed to parallel the projection the market would make if it existed. The inter-year transfer values determined by the firm represent the market price schedule for assets of different ages at the time of purchase. This schedule is then the basis for a contract between speculators (or a depreciation schedule) which is not varied for subsequent events. In the market, of course, subsequent purchasers have no contract with earlier purchasers, and transfer values are free to vary. If the above asset became obsolete at the end of year one, it would have no market value, but the second speculator would still be obliged to purchase it for 48·1 and sell it for 10·9 since he accepted that risk.

With regard to the possibility of capital gains or losses, Ladelle suggested two types of agreement: (i) in which all years 'agree' to share equally any unexpected capital gains/losses (as opposed to unexpected current gains/losses), or (ii) an agreement in which each year 'agrees' at the outset to accept gains/losses discovered in its year, e.g. by adjusting the asset to market value at the end of the year.

If speculators agree to share depreciation cost in accordance with an expected pattern of cash flows, they must be confident that speculators having the benefit of earlier years of use will not be able to reduce their (later) benefits. A problem arises with assets such as mines and quarries which do not have a fixed pattern of net cash flows and a fixed life, since the rate of extraction or depletion may vary from year to year. It may be that the firm has a certain pattern of extraction in mind at the time of purchase (it should consider how much of the asset will be converted into revenue each year as part of its discounted cash flow evaluation), but in any particular year, actual use may differ considerably from expected use. If a predetermined pattern of use were used to determine the depreciation pattern, and applied irrespective of actual use, net profit would of course vary from the expected constant.

This is a more general problem than it might appear, since almost all tangible assets may be regarded as containing a limited 'stock' of services, as well as a limited life independently of use. A 2-year-old car which has run 50,000 miles will have a lower value (i.e. more depreciation has been incurred) than a 2-year-old car with only 10,000 miles on the clock. Using our market pricing model, it is easy to see why. The harder run car will either cost more in future repairs, or will be scrapped earlier. The market is not concerned with whether an asset is time-related or use-related except that in the latter case, some average or typical pattern of use is implied.

If Ladelle speculators wished to protect themselves from over-use or mis-use by other speculators (or in fact any action, whether by earlier or later holders, which would reduce their benefits or increase their risks) they could pre-determine the effect on the transfer price of each possible action, so that their net benefits remain equal. If the asset were used heavily in early years, the depreciation would be correspondingly heavier in those years; the transfer value to later years would be lower, and could even be negative.

In the above example, for instance, if the cash flow pattern were speeded up to 80, 60, NIL, depreciation would be 61·0, 47·1 and − 8·1, as follows:

	1	*2*	*3*
Purchasing price	100	39	(8·1)
Selling price	39	(8·1)	—
Depreciation cost	61	47·1	(8·1)
Interest at 10%	10·0	3·9	(0·8)
Capital costs	71	51·0	(8·9)
Benefit	80	60	—
Net benefit	9·0	9·0	8·9*

* Difference on rounding.

Baxter suggests[29] an amendment to the Ladelle theory. He sinks in the depreciation charge those cost and revenue variations due to age alone. He instances increasing maintenance hours as an age factor but increasing maintenance rates of pay as an extraneous factor.

The justification for this is doubtful. If maintenance rates were expected to rise in future years, this would affect the market price schedule just as much as expected increases in maintenance hours. Buyers would offer less for older assets, thus reducing their depreciation cost until net annual profits were equalised. Nor is there any obvious reason why a group of speculators, or a firm constructing a depreciation schedule, should behave differently. There may be greater difficulty in forecasting non-age-related factors than age-related factors, or in controlling the latter, but these distinctions have no real bearing on asset valuation or depreciation.

The distinction might also be very difficult to apply, since some factors are indirectly age-related. For instance, it could be argued from historical experience that maintenance rates of pay are likely to rise with the age of the asset, and are therefore also age-related. Similarly, revenue and other parameters may be observed to follow some time trend and are therefore age-related.

(i) *Relevance*

On the Ladelle theory, all expected cost and revenue variations are sunk in the depreciation charge, so that a constant net profit (after tax) confirms all expectations. Conversely, *every* variation in net profit from year to year is significant to management in that it reveals a divergence from expectation. Variance analysis reveals the separate causes of divergence, and indicates the profit importance (order of priority) of controllable causes for investigation and correction.[30] This may be contrasted with Baxter's depreciation which results in unequal annual profits because of the varying incidence of non-age-related factors, as well as divergences from expectation. More analysis is necessary to get the same amount of exception information.

Constant net profit does not imply a constant *profitability* unless the asset base is also kept constant. If all profit (the remaining part of the cash flow) is distributed, then total assets will comprise only the depreciated primary asset and the retained depreciation assets. This will be a constant, since depreciation assets increase as depreciation on the primary asset increases.

The calculation of net benefit from year to year (see above) assumed that each year bore interest at the opportunity rate on the asset price at the beginning of the year. Equally it could have been assumed that each year takes over the whole of the debt for the original cost of 100 and also takes over the accumulated secondary assets. On the original debt interest would be payable, and on the depreciation assets further earnings would be made at the firm's opportunity rate. For a single project firm the accounts would appear as follows:

Profit and loss account	T_0	T_1	T_2	T_3	*Total*
Net cash flow		70	50	20	140
Less depreciation		51·9	37·2	10·9	100
Less interest on cost at 10%		10	10	10	30
Net profit on primary asset		8·1	2·8	—0·9	10
Earnings on depreciation assets at 10%		—	5·2	8·9	14·1
Overall net profit (distributed)		8·1	8·0	8·0	24·1

Balance sheet	T_0	T_1	T_2	T_3
Primary asset at cost	100	100	100	100
Less accumulated depreciation	—	51·9	89·1	100
Written down cost	100	48·1	10·9	—
Depreciation assets	—	51·9	89·1	100
Total assets	100	100	100	100

Here it is overall net profit and overall profitability which are equalised from year to year. The net profit on the primary asset alone is not equalised. In practice, firms do not usually keep separate project accounts unless projects are very large and geographically separated (so that joint costs are few); in the absence of project accounts overall net profit is the only performance indicator and Ladelle theory suits the situation. In a multi-project firm, net profit will still be constant in years in which the same number of projects are live, and will amount to the sum of the separate annual profits.

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[29] Baxter, W. T. *Depreciation* (Sweet and Maxwell), p. 42.

[30] This may also be regarded as a test of efficiency. Economic efficiency is a combination of the expected ratio of outputs to inputs (planning efficiency), and the ratio of actual results to expectations (control efficiency). Ladelle depreciation tests control efficiency.

It may also be noted here, that the project is earning 18 per cent. per annum (10 per cent. on original cost, plus a surplus of 8 per cent.). This is not the same as the discounted cash flow internal rate of return since the latter assumes either that cash flows are returned to the lenders of capital, thus reducing the capital outstanding from year to year, or that cash flows are reinvested within the firm at the same internal rate of return. Both assumptions are unrealistic. A better assumption is that the profit element (or a portion of it) is distributed, and the depreciation element is reinvested at the firm's marginal rate. This may be called the adjusted internal rate of return. In this example, assuming full profit payout and reinvestment in depreciation assets at 10 per cent., the adjusted internal rate of return is 18 per cent. as follows:

Net cash flows	−100	+70	+50	+20
18% adj. IROR		−18	−18	−18
10% on dep. assets			+ 5·2	+ 8·9
	−100	+52	+37·2	+10·9
Cumulative	−100	−48	−10·8	+ 0·1*

*Difference on rounding.

If some or all of the profit is retained, the asset base expands. It is then impossible to equalise both profit *and* profitability, though it is still possible to equalise whichever is preferred as an indicator.

Another difficulty arises with use-assets, since some of the associated costs of operation, including interest on capital, are time-costs, unrelated to use. This makes it impossible to equalise *either* net profit *or* net profit per unit of use when the time pattern of use differs from expectation. Time costs cannot be equalised because interest on capital depends on a use-related depreciation charge. The equalisation process can be applied only to the profit-before-time-costs per unit of use.

As with earlier concepts, Ladelle depreciation is not user depreciation.

The book values obtained are those pre-determined at the time of purchase. Therefore they have no relevance for subsequent decision-making.

(ii) *Objectivity*

Ladelle depreciation rests on expectation, but being determined at the time of purchase, and not year by year, it is less open to manipulation than depreciation from a discounted revenue calculation.

(iii) *Administrative convenience*

If a firm prepares a discounted cash flow evaluation of an asset before deciding to purchase it, it can easily prepare a schedule of depreciation. Difficulties arise in connection with varying use patterns and (perhaps) with capital gains or losses.

D Opportunity value theory

The value of an asset to the owner is defined as the adverse value of the entire loss, direct and indirect, that the owner might expect to suffer if he were to be deprived of the asset.[31]

This valuation depends on what the owner expects to do with the asset (e.g. sell it, or continue to hold it) and what he would do in the event of deprivation (e.g. replace it or go without). For the purposes of valuation, the owner is presumed to act to minimise his loss. For instance, if the replacement asset has a positive net present value, on losing the present asset, the owner would promptly acquire the replacement. The value of the present asset is the present value of its remaining cash flows, *minus* the net present value of the replacement, since this is the net loss on deprival.

This is true when the replacement would have a life exactly equal to the remaining years of the present asset. In the more general case, however, the two lives are not equal. If the replacement assets would last longer than the remaining years of the present asset, which is the more usual case, only a part of the replacement's net present value should be deducted, to reflect the true net loss on deprival. For the mathematical determination of value in this case see Appendix 1.

It has been stated[32] that the value of an asset cannot be greater than its replacement cost, that this is an upper limit, since if the asset were lost, only the replacement cost would have to be paid. From Appendix 1 equation (7) it can be seen that this is only true when the replacement asset is identical with the present asset, both as to remaining life and as to cash flows. It can readily be seen that if the present asset is unique, or is expected to generate much higher returns than a replacement, the value of the asset must include the extra returns, which, if lost, could not be replaced.

It is also stated[33] that the value of an asset *at the*

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[31] Bonbright, J. C. *The Valuation of Property* (New York, 1937), I., p. 71.

[32] Wright, F. W., 'Towards a General Theory of Depreciation', in *Readings in the Concept and Measurement of Income*, ed. Parker, R. H. and Harcourt, G. C. p. 286.

[33] Solomons, D., 'Economic and Accounting Concepts of Cost and Value', in *Modern Accounting Theory*, ed. Backer, M. (Englewood Cliffs, N.J., 1966), p. 124.

time of purchase is its replacement cost (thus justifying conventional accounting treatment). This is true if replacement cost is interpreted to include not only transport and installation charges (accountants usually include these in the historic capital cost), but also the loss of profit pending replacement (not considered by accountants, though this may add considerably to the value of the asset which should be insured, etc.).

Thus, opportunity value theory stands always on two legs: the best use of the asset (internal or external), and the best course of action in the absence of the asset. Value is the difference between with and without.[34]

The same proviso attaches to opportunity value as to discounted revenue value: the concept is not additive as several assets may claim the same returns. The replacement cost limit does not help where replacements are not available, or have inferior cash flows to the present assets.

Depreciation is the decline in opportunity value over the period. In a world of perfect foreknowledge, it is equal to the cash flow for the period, reduced by interest on the asset value at the start of the period, reduced again by interest on the net present value of replacements (see Appendix I, equation 10). The two latter terms comprise the income for the period.

In the real world, the above definitions apply only to ex ante measures of depreciation and income. The calculation of other measures of depreciation and income is more complex.

(i) *Relevance*

The opportunity value of an asset is the appropriate value for insurance, for litigation in the event of loss, and the minimum selling price, since it represents the net loss to the firm which should be compensated in any of these contingencies. (It should be remembered that the value depends on the definition of the asset and its attributable cash flows: if an entire firm were for sale, its opportunity value would have to be calculated on the entire cash flows and not by calculating and summing the values of separate assets).

When the opportunity value reaches nil, it is time to replace the asset. After this point, the remaining returns are worth less than the advantage in getting the net present value of the replacement earlier.

Since the concept of opportunity value rests on the best use of the asset, it implies that alternative uses have already been compared. Thus, while discounted revenue value may be compared with value in other uses (internal or external) for deciding on the best use of the asset, opportunity valuations must go through the process of comparing uses, and selecting the best use, before a comparison can be made with the position in the absence of the asset.

As with discounted revenue valuations income (ex ante) is related to capital values, but whereas income from discounted revenue valuations is straightforwardly equal to interest on the asset value at the start of period, income from opportunity valuations is equal to interest on the opening asset value *plus* the net present value of replacements to infinity.

Income is not equalised, but depreciation moves with cash flows, thus smoothing profit variations to some extent, but they could not be taken to reflect variations in the efficiency of management.

The table at the end of Appendix 1 shows that return on capital would be an even worse indicator of management efficiency since it grows astronomically as the asset value falls. This is due to the fixed element in profit (interest on the net present value of replacements). If it were not for this element, profitability would be constant. Therefore, by subtracting this fixed element and comparing with the opening capital, exception information on the variations of actual from expectation may be obtained.

Unlike other concepts, opportunity value depreciation is relevant for allocations within the firm (it is the same as user depreciation), but this is not helpful, as it is necessary to compare alternative uses in order to calculate value and depreciation.

(ii) *Objectivity*

Opportunity value is even more subjective than discounted revenue valuation, since it includes not only expectations consequent on ownership of the asset, but also expectations consequent on non-ownership. Therefore, the same reservations apply.

(iii) *Administrative convenience*

It must be admitted that in most firms the degree of forward orientation and of awareness of alternatives would not be adequate to support such a concept in any realistic manner, even if forecasting expertise were available, and data processing routines set up. The difficulty of using this concept would be multiplied according to the frequency of revaluing assets. It will therefore probably remain a special purpose valuation, made only when the need outweighs the cost.

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[34] Baxter, op. cit., refers to this as 'deprival value'. See also Wright, F. W., op. cit., p. 276, and Canning, J. B., *The Economics of Accountancy* (New York, 1929).

E Market value theory

The market approach to valuation has a history going back at least to the physiocrats, who distinguished the utility (use-value) which is inherent in assets from their price (exchange-value) on the market, and firmly identified value with price.

Accountants have always preferred verifiable exchange-values to subjectively-determined use-values, but in the nature of things, such valuations are only available at the time of purchase and at the time of disposal. For valuations in the intervening period they have generally abandoned the market, as explained in (A) above, and relied on conventional allocation procedures.

There is a body of opinion[35] that exchange-values should be used throughout the life of an asset. A firm after all, is using funds that are externally provided, in order to provide external dividends and, ultimately, an external refund of capital. Therefore, it should show at any time the amount of funds externally available for refund. This does not imply liquidation, only the possibility of liquidation. Similarly, for any individual asset, the amount of funds locked up in that asset is the market value which can be realised and switched into other assets or returned to the shareholders, neither more nor less. This is the asset's 'current cash equivalent' or 'external opportunity cost'.

It is no argument that 'fixed assets are held for use and not for sale', since, as already stated, an asset *should* be sold if its value to the firm is less than the value obtainable by sale. Moreover, many firms purchase long-lived assets with the explicit intention of holding them for an eventual capital profit. It may be noted here that the accountants' working distinction between fixed assets (held for use) and current assets (held for sale), rests entirely on subjective intentions, and is not a valid *economic* distinction since the same acquisition, use, valuation and disposal criteria apply to both categories.

It is probable that market valuations would have been accepted long ago if there were well-established second-hand markets in all assets. Unfortunately, this is true only for land, buildings, securities, motor vehicles, ships and a very limited range of general-purpose equipment, and only in some parts of the world. For a wide range of second-hand assets, the market may be non-existent or very imperfect. There may be no transactions, or a multiplicity at different prices. If a firm were hypothetically selling an asset at the end of its accounting period, how can it be said which sale the firm would have displaced, or whether a further purchaser would have been found, or in any case the price at which the sale would have taken place?

However, operating procedures have been established for conventional depreciation accounting, and the same could be done for market valuation accounting.[36] The conditions of sale should be specified, for instance, as to whether sale includes delivery, performance guarantee, credit and other possible items in the sale package. Secondly, the method of sale should be that appropriate to a normal voluntary liquidation, i.e. over a period of time, not a forced realisation at knock-down prices. Thirdly, operating procedures should specify the 'market' from which a price is to be read, e.g. the sources of data, and any rules of interpretation such as averaging.

If several prices were read, the highest one may be accepted as the operative price. If the demand curve for the asset were sloping, and the quantity to be sold were significant, the valuation procedure might specify that the operative price is to be taken as the mean of the price before and after the sale. If there were no discoverable realisation price, effectively it is nil, and so on. With experience, conventions would be established for reading prices for each type of asset, which could be followed and verified by auditors (though, like stock and cash-counts, they might have to carry them out on the balance sheet date).

An objection to using market price for many assets is that it would imply writing off almost the entire cost in the year of purchase in order to leave only some small scrap value on the books. In fact, some assets (research and development expenditure, goodwill) have not even a scrap value. This would drastically reduce profits in the year of purchase and, unless capital expenditure were carefully phased, entirely invalidate profit comparisons between years. It would in any case invalidate inter-firm comparisons.

Chambers' answer is that in making such expenditure, the firm is sacrificing liquidity ('foreclosing the opportunity of adapting itself by resale') for the sake of higher future profitability. The balance sheet will show a smaller asset base, and future profit and loss accounts (if expected benefits are realised) will show high profitability. Thus the balance sheet will correctly show the reduced liquidity of the firm for debt collateral purposes. It may be noted that lenders conventionally disregard intangible (unsaleable) assets anyway, so their exclusion from the balance sheet would be an improvement.

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[35] Well represented by Chambers, R. J., *Accounting Evaluation and Economic Behaviour* (Prentice-Hall, 1966), pp. 229–251.

[36] Market valuation here refers to the realisable value, net of selling expenses. The other version of market value is replacement cost, which is used to distinguish operating gains from holding gains. Replacement cost may be found analogously to net realisable value.

Similarly the exclusion of goodwill from the balance sheet might be welcomed from the point of view of inter-firm comparison. If all firms included goodwill in their balance sheets on the same super-profits basis, it would appear that they were all equally profitable, a *reductio ad absurdum.*

The sticking point, however, is the profit reduction. Many firms would be unwilling to invest in specialised plant, research expenditure, etc., if they knew that their current profits were to be correspondingly reduced, at least until shareholders and investors could be educated into taking a long-term view of profitability. Goldschmidt[37] prefers to restrict market valuations to liquid assets, i.e. saleable assets. Non-liquid assets, for which there is no second-hand market, he would value at their replacement cost (new), less the estimated loss of services in the existing asset, but no rules for estimating this loss are suggested.

It has seemed possible to some to construct a market price in the absence of an established market. But this depends on knowing the expected cash flows and cost of capital of every participant in the market, both sellers of the asset and buyers. Each individual buyer and seller diverges from the market price, buyers expecting higher net benefits and sellers expecting lower net benefits, except for the marginal buyer and the marginal seller, who jointly determine the market price. However, these schedules of expected benefits are not available to the individual firm for valuation purposes.

(i) *Relevance*

Market value (net realisable value) has obvious relevance wherever realisation of an asset is a possible course of action. As stated above, an asset should be realised if the proceeds of realisation can earn a higher return than the present asset.

Market values are not perfectly additive, since a firm may be sold for more than the sum of its parts. However, aggregate market value represents a lower limit to the valuation of a firm, the limit that would apply on a piecemeal realisation.

Market values provide depreciation figures which can not subsequently be found to be over- or understated. This may be compared with the frequent occurrence of profits and losses on sales of assets which occur with all pre-determined depreciation methods, and which in fact, reflect over-depreciation and under-depreciation (respectively) in earlier years.

Market-based depreciation figures should tend to equalise profit from year to year, if the investment is a marginal one, since there would be some correspondence between the firm's expected schedule of benefits, and that of the marginal seller. In effect, market valuation tends toward a discounted revenue valuation when the asset's internal rate of return is close to the opportunity cost of capital. However, this would not be true of assets held by more efficient firms, and in any case, the market may be too capricious to attach too much significance to profit variations from year to year.

Market based depreciation may be used in costing the services of an asset, even though it includes loss of value through time factors, such as obsolescence, since the latter are common to all uses of the asset. The important element is user-cost which may vary according to use. If an asset would lose more market value in one use than in another, this should be brought into the allocation decision.

(ii) *Objectivity*

A market price is an external fact which is in principle verifiable, once the procedures to be followed are defined. If the procedure is not defined (in such a way that two people would arrive independently at the same price), the value would be indeterminate and, in practice, would degenerate into mere guesswork, which would be subjective and unverifiable.

There is a shortage of empirical research on the practicability of market value bases. McDonald[38] found that 'the empirical data reported for automobiles provided evidence that direct reference to available market price indicators results in less disperse measures than those now obtained under generally accepted accounting principles'. However, automobiles have a good second-hand market and may be regarded as an easy case.

(iii) *Administrative convenience*

Net realisable values would not require a great clerical effort (e.g. compared with discounted revenue valuations or opportunity valuation) once the market price-reading procedures were set up.

Chambers makes the point that firms desirous of showing good profits would take great care to search for market values, i.e. they would accept greater administrative inconvenience as worthwhile.

V Conclusion

It is apparent that none of the depreciation concepts reviewed above is clearly relevant for all levels of decision-making, and also objective and administratively convenient. Any selection must be a compromise between these ideal attributes, a compromise which will depend on the weight given to each requirement.

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[37] Goldschmidt, Y., *Information for Management Decisions: A System for Economic Analysis and Accounting Procedures* (Ithaca, Cornell, 1970), p. 67.

[38] McDonald, D. L., 'A Test of the Application of the Feasibility of Market Based Measures in Accounting', *Journal of Accounting Research*, Spring 1968, pp. 38–49.

Conventional straight-line depreciation on historical cost is very easy to calculate, given cost, date of acquisition and the annual percentage rate to be applied. But this concept of depreciation, though almost universally applied for over half a century, does badly on the relevance test. Not only is the balance sheet frequently a travesty of 'the state of affairs', as understood by the typical shareholder, but also annual income after charging such depreciation can go down while efficiency is going up. The oft-quoted objectivity of straight-line depreciation turns out on closer examination to be a myth, though perhaps public confidence in accounting statements requires such a myth.

Discounted revenue valuations (discounting at the firm's opportunity cost of capital) are far more relevant, since they show the value to be obtained in the asset's present use, a necessary datum for comparison with value from any alternative use or from sale. For decisions on groups of assets, such as mergers and take-overs, joint valuations must be made as separate asset values usually cannot properly be added. If an asset is brought into the books at such a value, i.e. at above cost, profit after depreciation will be constant each year except for differences between expectations and cash flows, i.e. the method generates exception information for management control. If returns are discounted at the asset's internal rate of return on the other hand, the asset is brought into the books at cost, but its subsequent book value has little or no relevance. All discounted revenue valuations involve a lot of research and forecasting, and cannot be verified by a person independent of the valuer.

The Ladelle method pre-determines the allocation of depreciation so as to stabilise ex ante income. Thus it obtains the management control advantage of the discounted revenue basis without the fiction of valuing the asset at above the cost of an identical replacement, and without the subjectivity of annually revised valuations. This comparative objectivity is obtained at the expense of allocation decision-making relevance: the Ladelle method ignores the possibility of re-allocating an asset to another use, or of selling it. It is as easy to apply as the straight-line method.

Opportunity value is the only value which represents the net gain to the firm from ownership and the net loss by non-ownership. It is appropriate therefore for insurance, litigation and selling price decisions. On the other hand it involves, strictly speaking, a large number of discounted revenue calculations representing alternative uses of ownership and alternative courses of action on non-ownership, so it is very subjective, and very arduous to calculate. Like discounted revenue theory, it yields a concept of ex ante income which is related to the value placed on capital but, unlike discounted revenue income, it includes interest on the net present value of replacements, so income is not entirely smoothed.

Market value (net realisable value) is the external value of an asset and is always relevant where an asset could be sold. It was established in section (A) that a concept of income which includes market value gains as they accrue, rather than when they are realised, matches better with the uncertainty and illiquidity of asset holding. It is possible that objective procedures for ascertaining market values and incorporating them into the accounts could be developed but the main difficulty is with illiquid assets: their purchase would lead to big variations in annual profits. In effect this would be a step back from accrual accounting towards cash accounting.

The appropriate concept of depreciation for asset allocation decisions within the firm is user depreciation – the extra depreciation arising out of a particular use. Out of the concepts reviewed, opportunity value depreciation reflects the real loss to the firm by using an asset in its preferred use compared with the next best use. Pre-determined depreciation methods are furthest from user depreciation.

In a time of inflation, depreciation should be increased to reflect the declining value of the currency. (See Appendix 2). The appropriate index is a general consumer price index, not a particular asset price index. Failure to do this distorts decision-making.

It is probably true today that there is more awareness of the distortions induced by inflation than of the distortions induced by straight-line depreciation, and it is foreseeable that 'common purchasing power' statements will become familiar long before any of the alternative concepts of depreciation.

Yet there are indications for change. The accounting dogma that fixed assets should not be valued has become steadily less tenable as firms have become less inward looking and more acquisition and merger conscious. In a world of widespread shareholdings entirely divorced from management, the need to protect the investor (previously thought capable of looking after himself) has underlined the inadequacy of traditional reporting. Professional institutes are becoming far more conscious of the need for change.[39] At the same time business schools and universities are injecting a more academic content into the training of accountants, thus making them more receptive to new ideas. On the other hand, recent events[40] have made accountants even more cautious in departing from objective costs. One reaction is to attempt to educate the public into the deficiencies of accounting statements as guides to action. Another, more constructive, reaction is to make accounting statements more relevant, but to segregate objective historical and factual data from subjective estimates and opinions as to the future.[41] Depreciation of course would come into the latter category, and could then be calculated in the most relevant way.

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[39] See my article, 'Accountancy under Attack', in *The Accountancy Journal*, July 1971, Institute of Chartered Accountants of Ceylon, Colombo.

Before this can be achieved, however, there is considerable need for research into the uses and relevance of accounting data, and into the practicability of various concepts. No amount of hypothesis-building can avoid the need for testing their practical adequacy in the field.

Appendix 1

Mathematics of classical asset valuation

1. If an asset costs C, is expected to generate net operating receipts (revenue minus operating costs and taxes) at the end of year 1, 2 . . . y of b_1 $b_2 \ldots b_y$, and a final sale value of S_y in year y, and the cost of capital is given by the fraction i, the present value V_r of this stream of costs and receipts is given by:

$$V_r = -C + \sum_{n=1}^{n=y} \frac{b_n}{(1+i)^n} + \frac{S_y}{(1+i)^y} \qquad (1)$$

If this asset were to be replaced after y years by a similar asset, which in turn will be replaced, and so on, the present value of this stream of costs and receipts to infinity ($V_{r\infty}$) is given by:

$$V_{r\infty} = \frac{-C + \sum_{n=1}^{n=y} \frac{b_n}{(1+i)^n} + \frac{S_y}{(1+i)^y}}{1-(1+i)^{-y}} \qquad (2)$$

The optimal asset life and pattern of maintenance costs will be given by the combination of values for y and b_1 $b_2 \ldots b_y$ and S_y which maximises $V_{r\infty}$. It will be assumed below that these values have been determined and $V_{r\infty}$ has been maximised.

The above equations refer to an asset which is not owned, but is available on the market as a potential replacement. Where there is more than one potential replacement asset, the appropriate one will be the one showing highest $V_{r\infty}$.

2. If an asset is owned, and is expected to generate net operating receipts of a_1 $a_2 \ldots a_k$ and a final sale value of s_k in year k, cost of capital as before, the present value V_p of this stream of receipts is given by:

$$V_p = \sum_{n=1}^{n=k} \frac{a_n}{(1+i)^n} + \frac{s_k}{(1+i)^k} \qquad (3)$$

Assuming that $V_{r\infty}$ is positive, so that the present asset would be replaced, the present value ($V_{p\infty}$) of receipts and costs from the present asset and its future replacements to infinity is given by:

$$V_{p\infty} = \sum_{n=1}^{n=k} \frac{a_n}{(1+i)^n} + \frac{s_k}{(1+i)^k} + \left[\frac{(1+i)^{-k}}{1-(1+i)^{-y}}\right] \left[-C + \sum_{n=1}^{n=y} \frac{b_n}{(1+i)^n} + \frac{S_y}{(1+i)^y}\right] \qquad (4)$$

The optimal remaining life of the present asset is given by the value of k which maximises $V_{p\infty}$. It will be seen that early replacement loses some possible earnings (a) but increases the sale value (s_k) and brings the stream of earnings on the replacement asset nearer. It will be assumed below that k has been determined so as to maximise $V_{p\infty}$.

3. The *value* of the present asset is not so much as $V_{p\infty}$ since if the asset were lost, $V_{r\infty}$ would still be available. The value of the present asset at the end of year j with k years of life remaining (V_j) is therefore given by $V_{p\infty} - V_{r\infty}$.

If $\sum_{n=1}^{n=y} \frac{b_n}{(1+i)^n}$ is represented by b(y)

$\frac{S_y}{(1+i)^y}$ by S(y)

$\sum_{n=1}^{n=k} \frac{a_n}{(1+i)^n}$ by a(k)

and $\frac{s_k}{(1+i)^k}$ by s(k)

$$V_j = a(k) + s(k) + \left[-C + b(y) + S(y)\right] \left[\frac{(1+i)^{-k} - 1}{1-(1+i)^{-y}}\right] \qquad (5)$$

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[40] Such as the Rolls-Razor, GEC/AEI and Pergamon affairs in the U.K.

[41] See for instance Rayman, R. A., 'Segregated Funds Accounting', in *Accountancy* (UK), June 1970, pp. 422–9.

The resemblance of this formula to Merrett and Sykes' general valuation formula[42] will be observed. The latter values an asset on its costs alone, treating variations in revenue as negative costs.

4. Depreciation on the asset is the decline in value over the period. Expanding the first two terms of the above equation, value at the end of year j is given by:

$$V_j=\left(\frac{a_{j+1}}{1+i}+\frac{a_{j+2}}{(1+i)^2}\cdots+\frac{a_{j+k}}{(1+i)^k}\right)$$

$$+\frac{s_k}{(1+i)^k}+[-C+b(y)+S(y)]$$

$$\left[\frac{(1+i)^{-k}-1}{1-(1+i)^{-y}}\right]$$

Similarly,

$$V_{j-1}=\frac{a_j}{1+i}+\frac{a_{j+1}}{(1+i)^2}\cdots+\frac{a_{j+k}}{(1+i)^{k+1}}$$

$$+\frac{s_k}{(1+i)^{k+1}}+[-C+b(y)+S(y)]$$

$$\left[\frac{(1+i)^{-k-1}-1}{(1+i)\left(1-(1+i)^{-y}\right)}\right]$$

Therefore, depreciation in year j is given by:

$$d_j=V_{j-1}-V_j=\frac{a_j}{1+i}-i\sum_{n=j+1}^{n-j+k}\frac{a_n}{(1+i)^{n-j+1}}$$

$$\left[\frac{s_k}{(1+i)^{k+1}}\right]-i\left[\frac{1}{(1+i)^{k+1}}\right]$$

$$\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right] \tag{6}$$

5. Since k is determined, and therefore j also (=the year in which k years of life remain), we will introduce a new subscript t so that V_t is the value t years after year 0 (at year 0, k years of life remain), and d_t is the depreciation in the year finishing with a value V_t, where $t \leqq k$. For instance, if in 1972, a machine has an expected remaining life of 7 years (k=7), t can refer to any year between 1972 and 1979. Depreciation in year 1976, for instance, would be found by putting t=4.

$$V_t=\frac{a_{t+1}}{1+i}+\frac{a_{t+2}}{(1+i)^2}\cdots\frac{a_k}{(1+i)^{k-t}}+\frac{s_k}{(1+i)^{k-t}}$$

$$-[1-(1+i)^{t-k}]\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right] \tag{7}$$

$$V_{t-1}=\frac{a_t}{1+i}+\frac{a_{t+1}}{(1+i)^2}\cdots\frac{a_k}{(1+i)^{k-t+1}}$$

$$+\frac{s_k}{(1+i)^{k-t+1}}-[1-(1+i)^{t-k-1}]$$

$$\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]$$

$$\therefore d_t=\frac{a_t}{1+i}-i\sum_{n=t+1}^{n=k}\frac{a_n}{(1+i)^{n-t+1}}$$

$$-i\frac{s_k}{(1+i)^{k-t+1}}-i\left[\frac{1}{(1+i)^{k-t+1}}\right]$$

$$\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]$$

$$=a_t-i\left[\sum_{n=t}^{n=k}\frac{a_n}{(1+i)^{n-t+1}}+\frac{s_k}{(1+i)^{k-t+1}}\right.$$

$$+\left(\frac{1}{(1+i)^{k-t+1}}\right)$$

$$\left.\left(\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right)\right] \tag{8}$$

6. Income in any year t (I_t), where $t \leqq k$, is equal to the receipts in year t, reduced by depreciation for the year:

$$I_t=a_t-d_t=i\sum_{n=t}^{n=k}\frac{a_n}{(1+i)^{n-t+1}}+\frac{s_k}{(1+i)^{k-t+1}}$$

$$+\left(\frac{1}{(1+i)^{k-t+1}}\right)$$

$$\left(\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right)$$

But $$V_{t-1}=\sum_{n=t}^{n=k}\frac{a_n}{(1+i)^{n-t+1}}+\frac{s_k}{(1+i)^{k-t+1}}$$

$$-\left[1-\frac{1}{(1+i)^{k-t+1}}\right]$$

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[42] Merrett, A. J. and Sykes, Allen *The Finance and Analysis of Capital Projects* (Longmans, 1963), p. 473.

$$\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]$$

Therefore, $$I_t=iV_{t-1}+i\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right] \quad (9)$$

and $$d_t=a_t-iV_{t-1}-i\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right] \quad (10)$$

Assuming no change in expectations, and perfect prescience, income is equal to interest on the asset value at the beginning of the year, plus interest on the net present value of replacements to infinity.

7. The above equations refer to value, depreciation and income *expected at year* 0 for any desired year. An expected value may change at any time. It may change even after it becomes "actual" in the respective year, due to corrections of errors in the recording and processing of transactions. We may therefore introduce uncertainty and make our expressions dynamic by using a further subscript to denote the year in which a value is estimated.

$a_{1(0)}$, $a_{2(0)}$ . . . will be the receipts in years 1, 2 . . . as expected in year 0. $a_{2(1)}$ will be the receipt in year 2 (revised estimate in year 1). $a_{1(1)}$, $a_{2(2)}$ . . . will be actual receipts in years 1, 2 . . . as recorded in the respective years.

If we consider the first year's life of an asset, the value at the beginning of the year may be estimated at the beginning of the year ($V_{0(0)}$) or at the end of the year ($V_{0(1)}$). Similarly the end-of-year value ($V_{1(0)}$ or $V_{1(1)}$). This gives us four possible measures of depreciation as follows:

$V_{0(0)}-V_{1(0)}$ which we will call ex ante depreciation

$V_{0(1)}-V_{1(1)}$ which we will call ex post depreciation

$V_{0(0)}-V_{1(1)}$ which we will call mixed depreciation

$V_{0(1)}-V_{1(0)}$ which we will ignore. (This measure is also mixed, but lacks significance).

If we considered a later year in the life of an asset, it is apparent that there would be a permutation of values from expectations made in all possible years. In fact, for depreciation in year t there are $(t+1)^2$ permutations from estimates of V_t and V_{t-1} in years 0, 1 . . . t of which t^2 are wholly ex ante, and $(2t+1)$ depend at least partly on estimates in year t. To avoid confusion, we will reserve the term "ex ante depreciation" for the difference between beginning and end-of-year valuations made at the beginning of the respective year, i.e. $V_{t-1(t-1)}-V_{t(t-1)}$. Similarly, ex post depreciation is $V_{t-1(t)}-V_{t(t)}$ and mixed depreciation is $V_{t-1(t-1)}-V_{t(t)}$.

8. Assuming no change in k, the optimum remaining life, *ex ante depreciation* is given by equation (10) where all variables carry the second subscript (t−1). *Ex post depreciation* is similarly represented with subscript (t). For *mixed depreciation,* it will be useful to introduce a further term e for the error or difference between one year's expectation and the next, i.e. $a_{t(t-1)}+e_{t(t-1)}=a_{t(t)}$. Similarly, f_k represents the error in the scrap values s_k, and g_k represents the error in the discounted value of future replacements to infinity.

Then, $V_{t-1(t-1)}-V_{t(t)}=a_{t(t-1)}$

$$-i\left[\frac{a_{t(t-1)}}{1+i}\dots+\frac{a_{k(t-1)}}{(1+i)^{k-t+1}}+\frac{s_{k(t-1)}}{(1+i)^{k-t+1}}+\frac{1}{(1+i)^{k-t+1}}\left(\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right)_{(t-1)}\right]$$

$$-\left[\frac{e_{t+1(t-1)}}{1+i}\dots+\frac{e_{k(t-1)}}{(1+i)^{k-t}}+\frac{f_{k(t-1)}}{(1+i)^{k-t}}+\frac{g_{k(t-1)}}{(1+i)^{k-t}}+g_{k(t-1)}\right]$$

$$=a_{t(t-1)}-i\,V_{t-1(t-1)}-i\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t-1)}$$

$$-\sum_{n=t+1}^{n=k}\frac{e_{n(t-1)}}{(1+i)^{n-t}}-\frac{f_{k(t-1)}}{(1+i)^{k-t}}$$

$$-\frac{g_{k(t-1)}}{(1+i)^{k-t}}-g_{k(t-1)} \quad (11)$$

9. For each measure of depreciation there are $(t+1)$ measures of income, making $(t+1)^3$ measures in all, since income may include any one of t ex ante estimates of the cash flow for the year or an ex post figure. We will limit ourselves as before to the cash flow figures estimated at the beginning of the relevant year (ignoring earlier years) and at the end of the year. Thus we have:

$a_{t(t-1)}-V_{t-1(t-1)}+V_{t(t-1)}$ which we will call ex ante income

$a_{t(t)} - V_{t-1(t)} + V_{t(t)}$ which we will call ex post income

$a_{t(t)} - V_{t-1(t-1)} + V_{t(t)}$ which we will call mixed income

$a_{t(t)} - V_{t-1(t-1)} + V_{t(t-1)}$ which we will call variable income[43]

$$\left.\begin{array}{l} a_{t(t-1)} - V_{t-1(t-1)} + V_{t(t)} \\ a_{t(t-1)} - V_{t-1(t)} + V_{t(t-1)} \\ a_{t(t-1)} - V_{t-1(t)} + V_{t(t)} \\ a_{t(t)} - V_{t-1(t)} + V_{t(t-1)} \end{array}\right\} \text{which we will ignore}$$

10. *Ex ante income* is given by (9) with second subscript (t−1). Similarly, *Ex post income* is given by (9) with second subscript (t). *Mixed income* is based on (11):

$$= a_{t(t)} - a_{t(t-1)} + i\,V_{t-1(t-1)} + i\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t-1)} + \sum_{n=t+1}^{n=k} \frac{e_{n(t-1)}}{(1+i)^{n-t}} + \frac{f_{k(t-1)}}{(1+i)^{k-t}} + \frac{g_{k(t-1)}}{(1+i)^{k-t}} + g_{k(t-1)}$$

$$= i\,V_{t-1(t-1)} + i\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t-1)} + \sum_{n=t}^{n=k} \frac{e_{n(t-1)}}{(1+i)^{n-t}} + \frac{f_{k(t-1)}+g_{k(t-1)}}{(1+i)^{k-t}} + g_{k(t-1)} \qquad (12)$$

Thus mixed income is ex ante income, plus the sum of *all* differences from ex ante estimates discounted to the present, plus the difference in the net present value of replacements to infinity. *Variable income* is

$$a_{t(t)} - a_{t(t-1)} + i\,V_{t-1(t-1)} + i\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t-1)}$$

$$= i\,V_{t-1(t-1)} + i\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t-1)} + e_{t(t-1)} \qquad (13)$$

Variable income is ex ante income, adjusted for any difference in the cash flow for the year. It differs from mixed income in that the latter includes also revisions to future estimated cash flows.

11. A variable not considered so far is the interest cost of capital (i). The cost of capital may be expected to change in future years, because of changes in market rates, and/or changes in investment opportunity cut-off rates adopted by the firm. Thus, we may expect rates $i_1, i_2 \ldots i_t$ in successive years. Also expectations may change. Thus, $i_{1(0)}$ is the cost of capital in year 1 expected at the beginning of the year, $i_{1(1)}$ is the actual cost for that year, and so on.

This makes very little difference to the above equations, though expressions using this further notation would be very lengthy. Briefly, whenever a sum of money arises in year n, its present value is found by dividing by $(1+i_1)(1+i_2)\ldots(1+i_n)$, instead of $(1+i)^n$, as previously. If this valuation is made in year t, the divisor is $(1+i_{1(t)})(1+i_{2(t)})\ldots(1+i_{n(t)})$. In a world of unchanging expectations, income is equal to interest at the current year's rate on the asset value at the beginning of the year plus the net present value of replacements, where all cash flows entering into that value are discounted back from year to year at the respective rate for each year. Similarly, depreciation is equal to the cash flow for the year, minus income.

Returning to the world of changing expectations,

(i) *ex ante income* for year t, where all values are as expected at t−1 is

$$i_{t(t-1)}\,V_{t-1(t-1)} + i_{t(t-1)}\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t-1)} \qquad (14)$$

and *ex ante depreciation* is

$$a_{t(t-1)} - i_{t(t-1)}\,V_{t-1(t-1)} - i_{t(t-1)}\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t-1)} \qquad (15)$$

(ii) *ex post income* for year t where all values are as expected at t is

$$i_{t(t)}\,V_{t-1(t)} + i_{t(t)}\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t)} \qquad (16)$$

and *ex post depreciation* is

$$a_{t(t)} - i_{t(t)}\,V_{t-1(t)} - i_{t(t)}\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]_{(t)} \qquad (17)$$

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[43] After Sidney Alexander, 'Income Measurement in a Dynamic Economy', republished in *Studies in Accounting Theory* by W. T. Baxter and Sidney Davidson (eds.).

(iii) mixed income involves expectations made at the beginning *and* end of the year. In any year, the quotient found by dividing one plus the actual (or latest expected) interest rate for the year by one plus the rate expected at the beginning of the year will be given by q. Thus:

$$\frac{1+i_{t(t)}}{1+i_{t(t-1)}}=q_{t(t-1)} \text{ and } \frac{1+i_{t+1(t)}}{1+i_{t+1(t-1)}}$$

$$=q_{t+1(t-1)}$$

$$V_{t-1(t-1)}-V_{t(t)}=a_{t(t-1)}-i_{t(t)}$$

$$\left[\sum_{n=t}^{n=k}\frac{a_n q_t\cdots q_n}{(1+i_t)\dots(1+i_n)}\right.$$

$$+\frac{s_k q_t\cdots q_k}{(1+i_t)\dots(1+i_k)}$$

$$\left.+\frac{q_t\cdots q_k}{(1+i_t)\dots(1+i_k)}\left(\frac{-C+b(y)+S(y)}{1-(1+i_t)^{-y}}\right)*\right]$$

$$-\sum_{n=t+1}^{n=k}\frac{e_n q_{t+1}\cdots q_n}{(1+i_{t+1})\dots(1+i_n)}$$

$$-\frac{f_k q_{t+1}\cdots q_k}{(1+i_{t+1})\dots(1+i_k)}$$

$$-\frac{g_k q_{t+1}\cdots q_k}{(1+i_{t+i})\dots(1+i_k)}-g_k \tag{18}$$

* This expression must be recalculated for changes in i. All values are as expected at t–1 except where otherwise stated.

Mixed depreciation, therefore, is equal to the expected cash flow for the year, minus actual interest on (the capital as estimated at the beginning of the year plus the net present value of replacements, with corrections for changes in interest rates), minus also the discounted sum of changes in future cash flows, similarly corrected, minus the difference in the net present value of replacements to infinity.

Mixed income$=a_{t(t)}$ minus mixed depreciation, as above

$$=i_{t(t)}\left[\sum_{n=t}^{n=k}\frac{a_n q_t\cdots q_n}{(1+i_t)\dots(1+i_n)}\right.$$

$$+\frac{s_k q_t\cdots q_k}{(1+i_t)\dots(1+i_k)}+\frac{q_t\cdots q_k}{(1+i_t)\dots(1+i_k)}$$

$$\left.\left(\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right)*\right]$$

$$+\sum_{n=t}^{n=k}\frac{e_n q_t\cdots q_n}{(1+i_t)\dots(1+i_n)}$$

$$+\frac{(f_k+g_k)(q_{t+1}\cdots q_k)}{(1+i_{t+1})\dots(1+i_k)}+g_k \tag{19}$$

* This expression must be recalculated for changes in i. All values are as expected at t–1 except where otherwise stated.

This may be described as actual interest for the year on (the capital as estimated at the beginning of the year plus the net present value of replacements, corrected for changes in interest rates), plus the discounted sum of changes in all cash flows from the previous year's expectations, similarly corrected, plus the difference in the net present value of replacements to infinity.

(iv) variable income$=a_{t(t)}$ minus ex ante depreciation.

$$=i_{t(t-1)}V_{t-1(t-1)}+i_{t(t-1)}$$

$$\left[\frac{-C+b(y)+S(y)}{1-(1+i)^{-y}}\right]+e_{t(t-1)} \tag{20}$$

Illustration

A presently-owned asset is expected to generate cash flows of 700, 500, 300, 100 and 50 in successive years. The best replacement asset would cost 1200 and generate 400 a year for 5 years, this being its optimum life. Future replacements are expected to cost the same and generate the same cash flows (ignoring changes in the value of money). The expected cost of capital is 10% p.a. throughout.

The first problem is to determine the optimum remaining life (k) of the present asset. This depends partly on the cash flows from replacements, which will be calculated first:

$$V_r=-1200+\frac{400}{1{\cdot}1}+\frac{400}{1{\cdot}1^2}+\frac{400}{1{\cdot}1^3}+\frac{400}{1{\cdot}1^4}+\frac{400}{1{\cdot}1^5}$$

$$=316{\cdot}3 \tag{1}$$

$$V_{r\infty}=\frac{316{\cdot}3}{1-\left(\frac{1}{1{\cdot}1}\right)^5}=\frac{316{\cdot}3}{{\cdot}379}$$

$$=834{\cdot}6 \tag{2}$$

Setting $k=5, V_p=\frac{700}{1{\cdot}1}+\frac{500}{1{\cdot}1^2}+\frac{300}{1{\cdot}1^3}+\frac{100}{1{\cdot}1^4}+\frac{50}{1{\cdot}1^5}$

$$=1374{\cdot}4 \tag{3}$$

$$V_{p\infty}=1374{\cdot}4+\frac{\left(\frac{1}{1{\cdot}1}\right)^{5}}{{\cdot}379}\times 316{\cdot}3$$

$$=1374{\cdot}4+\frac{834{\cdot}6}{1{\cdot}61}$$

$$=1892{\cdot}8 \tag{4}$$

Setting k=4, $V_p=\frac{700}{1{\cdot}1}+\frac{500}{1{\cdot}1^2}+\frac{300}{1{\cdot}1^3}+\frac{100}{1{\cdot}1^4}$

$$=1343{\cdot}3$$

$$V_{p\infty}=1343{\cdot}3+\frac{\left(\frac{1}{1{\cdot}1}\right)^{4}}{{\cdot}379}\times 316{\cdot}3$$

$$=1343{\cdot}3+\frac{834{\cdot}6}{1{\cdot}464}$$

$$=1913{\cdot}4$$

Setting k=3, $V_p=\frac{700}{1{\cdot}1}+\frac{500}{1{\cdot}1^2}+\frac{300}{1{\cdot}1^3}$

$$=1275{\cdot}0$$

$$V_{p\infty}=1275{\cdot}0+\frac{\left(\frac{1}{1{\cdot}1}\right)^{3}}{{\cdot}379}\times 316{\cdot}3$$

$$=1275{\cdot}0+\frac{834{\cdot}6}{1{\cdot}331}$$

$$=1902{\cdot}0$$

$V_{p\infty}$ is at a maximum (1913·4) when k=4, therefore this is the optimum time of replacement. The value of the asset at present is therefore $V_{p\infty}-V_{r\infty}=1913{\cdot}4-834{\cdot}6=1078{\cdot}8$.

In a single equation,

$$V_j=\frac{700}{1{\cdot}1}+\frac{500}{1{\cdot}1^2}+\frac{300}{1{\cdot}1^3}+\frac{100}{1{\cdot}1^4}+\left[-1200+\frac{400}{1{\cdot}1}+\frac{400}{1{\cdot}1^2}+\frac{400}{1{\cdot}1^3}+\frac{400}{1{\cdot}1^4}\right]\left[\frac{\left(\frac{1}{1{\cdot}1}\right)^{4}-1}{1-\left(\frac{1}{1{\cdot}1}\right)^{5}}\right]$$

$$=1343{\cdot}3+[316{\cdot}3]\left[\frac{\frac{1}{1{\cdot}464}-1}{1-\frac{1}{1{\cdot}61}}\right]$$

$$=1343{\cdot}3+[316{\cdot}3]\,[-0{\cdot}8364]$$

$$=1078{\cdot}8 \tag{5}$$

Depreciation in year j will depend also on the value in the previous year (V_{j-1}). Since the cash flow in the previous year (a_{j-1}) is not given, equation (6) cannot be calculated. Depreciation in any future year t can be calculated where t is less than k (4). Putting t=1 (k is still 4):

$$V_1=\frac{500}{1{\cdot}1}+\frac{300}{1{\cdot}1^2}+\frac{100}{1{\cdot}1^3}-\left[1-\left(\frac{1}{1{\cdot}1}\right)^{3}\right]\left[\frac{316{\cdot}3}{{\cdot}379}\right]$$

$$=777{\cdot}5-(0{\cdot}6562\times 316{\cdot}3)$$

$$=570{\cdot}0 \tag{7}$$

$$d_1=700-{\cdot}1\left[\frac{700}{1{\cdot}1}+\frac{500}{1{\cdot}1^2}+\frac{300}{1{\cdot}1^3}+\frac{100}{1{\cdot}1^4}+\frac{1}{1{\cdot}1^4}\left(\frac{316{\cdot}3}{{\cdot}379}\right)\right]$$

$$=700-{\cdot}1[1343{\cdot}3+570{\cdot}0]$$

$$=508{\cdot}7 \tag{8}$$

Check: $V_0-V_1=1078{\cdot}8-570{\cdot}0=508{\cdot}8$ (difference due to rounding).

$$I_1=a_1-d_1=700-508{\cdot}7$$

$$=191{\cdot}3$$

$$={\cdot}1(1078{\cdot}8)+{\cdot}1\left(\frac{316{\cdot}3}{{\cdot}379}\right)$$

$$=191{\cdot}3 \tag{9}$$

$$d_1=700-{\cdot}1(1078{\cdot}8)-{\cdot}1\left(\frac{316{\cdot}3}{{\cdot}379}\right)$$

$$=508{\cdot}7 \tag{10}$$

To illustrate the various concepts of depreciation and income in a world of changing expectations we will assume that the actual cash flow in year 1 is 600 (100 less than expected), and that the revised expectations for future years are 400, 300, 100 and 50. No changes are expected in the cost of a replacement, or its cash flows, or in the rate of interest.

Then $e_{1(0)}=-100$ and $e_{2(0)}=-100$

Ex ante depreciation in year 1
$=V_{0(0)}-V_{1(0)}=1078\cdot 8-570=508\cdot 8$

Ex post depreciation and mixed depreciation need valuations made with hindsight:

$$V_{1(1)}=\frac{400}{1\cdot 1}+\frac{300}{1\cdot 1^2}+\frac{100}{1\cdot 1^3}+\frac{834.6}{1\cdot 331}-834\cdot 6$$
$$=479\cdot 0$$

$$V_{0(1)}=\frac{600}{1\cdot 1}+\frac{400}{1\cdot 1^2}+\frac{300}{1\cdot 1^3}+\frac{100}{1\cdot 1^4}+\frac{834\cdot 6}{1\cdot 464}-834\cdot 6$$
$$=905\cdot 3$$

Ex post depreciation$=V_{0(1)}-V_{1(1)}=905\cdot 3-479\cdot 0$
$=426\cdot 3$

Mixed depreciation$=V_{0(0)}-V_{1(1)}=1078\cdot 8-479\cdot 0$
$=599\cdot 8$

Or $700-\cdot 1(1078\cdot 8)-\cdot 1(834\cdot 6)+\frac{100}{1\cdot 1}=599\cdot 5$ (11)

Ex ante income$=\cdot 1(1078\cdot 1)+\cdot 1(834\cdot 6)$
$=191\cdot 3$

Ex post income$=\cdot 1(905\cdot 3)+\cdot 1(834\cdot 6)$
$=174\cdot 0$

Mixed income$=\cdot 1(1078\cdot 8)+\cdot 1(834\cdot 6)-100-\frac{100}{1\cdot 1}$
$=0\cdot 5$ (12)
($600-599\cdot 5$ mixed depreciation$=0\cdot 5$)

Variable income$=\cdot 1(1078\cdot 8)+\cdot 1(834\cdot 6)-100$
$=91\cdot 4$ (13)

The pattern of ex ante depreciation and income may be seen in the following table.

Year	*Value*	*Depreciation*	*Cash flow*	*Income*	*Return on capital %*	*Analysis of income* 10% *on opening asset value*	10% *on NPV of replacements*	*Total*
0	1078·8	—	—	—	—	—	—	—
1	570·0	508·8	700	191·2	17·7	107·9	83·6	191·5
2	210·4	359·6	500	140·4	4 ·6	57·0	83·6	140·6
3	15·0	195·5	300	104·5	4 ·7	21·0	83·6	104·6
4	Nil	15·1	100	84·9	566·0	1·5	83·6	85·1
		1079·0	1600	521·0		187·4	334·4	521·8

Differences are due to rounding.

Appendix 2

Depreciation and inflation

A general defect in current accounting practice is the presentation of data in terms of an unstable currency unit. However this may be remedied more easily than, say, the delay in recognising unrealised gains. There seems to be no theoretical objection to converting economic exchanges into any desired currency unit. In much the same way as foreign currency transactions are converted at prevailing rates of exchange, so transactions in, say, pounds of different years may be converted to 1972 pounds by multiplying by a factor representing the increase in the price level, thus putting all data onto a common purchasing power basis.

There is still some controversy over *whose* purchasing power provides the more appropriate basis. Company directors are apt to consider that it is "their" companies' purchasing power which is relevant and, more specifically, purchasing power over the type of assets they are accustomed to using. Nevertheless, companies are not generally limited to the purchase of any particular types of asset, or to any particular asset mix, and it is now more widely preferred to base capital and income determinations on the purchasing power of those who subscribe capital and receive the profits. This is therefore an index number problem which is capable of approximative solution. Consumer price indices have been recommended[44] as approximations to shareholder purchasing power in countries in which they have been constructed. From the point of view of the firm, such an index is objective (and independent of the firm's own actions), and administratively convenient.

At the time of writing, the Institute of Chartered Accountants (England and Wales) has circulated for comment a draft recommendation based on the above principles. A simple numerical example is given below:

A firm purchases an asset for £100 at the beginning of the year, holds it for one year during which the general price level rises 10% and the asset price level rises 50%, then sells it for £150. (This may be regarded as inventory, or an asset with a one year life which generates a single return of £150, without making any difference to the argument).

Money capital has increased from £100 to £150, so money profit (conventional accounting) is £50. Real profit, however, is the increase in the real purchasing power of capital, which is conventionally measured in terms of its purchasing power at the *end* of the year. Opening capital in end-of-year pounds is £100 $\times \frac{110}{100}$ = £110. Closing capital (end-of-year pounds) is £40. Only £40 can be consumed and leave as much real capital as at the beginning of the year.

This concept of capital maintenance may be contrasted with the replacement cost concept, which implies maintenance of the purchasing power of initial capital over the *particular* assets in which it has been invested. In the above example, £150 is required to replace the asset at the end of the year so capital has barely been maintained, and not increased. Real profit is nil! As mentioned above, this is anomalous, as the firm does not reinvest the whole of its profits, part being distributed, of which part (the greater part) is consumed, nor does it reinvest so as to maintain the same asset mix (and for any other asset mix this concept disintegrates), nor *should* it reinvest in a replacement unless the replacement promises to be sufficiently profitable. If, on evaluation, a replacement were approved, additional finance would be necessary because the operation of this asset now represents a more highly capitalised business. Depreciation and profit should not depend on subjective replacement intentions.

This simplified example could be varied to allow for revaluing assets without altering the above argument. Similarly, if only part of the asset is consumed (say one quarter) and one quarter of the revenue is realised, the balance of the asset being left on the balance sheet, replacement cost accounting still (wrongly) shows a nil profit, as follows:

Opening balance sheet

Asset	100	Capital	100
	—		—

Profit and loss account

Depreciation:		Revenue	37½
¼ × replacement cost 150	37½		
Net profit	—		
	—		—
	37½		37½
	—		—

Closing balance sheet

Asset – current replacement value	150	Capital – Opening	100
less depreciation (¼)	37½	add inflation on asset	50*
	—		—
	112½		150
Cash	37½	Real profit	—
	—		—
	150		150
	—		—

* This could be passed through the profit and loss account so as to show a holding gain of 50, but there is no point in doing this, if, as replacement theorists hold, the whole of the gain is fictitious.

In fact, replacement cost theory admits only operating gains as real income: all holding gains are deemed fictitious. This may be valid in social accounting, in which holding gains and losses may be deemed to cancel out, but it is not true of individual firms, which may plan and achieve real holding gains on assets which rise in price more than the general price level.[45]

If accounts are not rendered in a common purchasing power denominator, profit is *overstated* by the undercharge for the maintenance of physical assets, *overstated* again by the omission of the real loss on monetary assets, and *understated* by the omission of the real profit on monetary liabilities. The corporate sector is a net borrower, so the last two items add up to an omission of real profit. However, the undercharge for depreciation and materials consumed is quantitatively far more important. The net overstatement of profit affects allocation, distribution and consumption decisions.

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[44] Keynes, J. M., *A Treatise on Money*, p. 54. See also Jones, R. C., *Price Level Changes and Financial Statements* (Iowa City, 1955), p. 3.

[45] On this subject, see Chambers, R. J., *Accounting Evaluation and Economic Behaviour*, ch. 10; Wilcox, E. B., 'Price Fluctuations', in *Modern Accounting Theory*, ed. M. Backer; and Bennett, A. H. M., *Management Accountancy in Ceylon* (Academy of Administrative Studies, Colombo, 1971), pp. 260–272.

As regards allocation decisions, not all firms and industries will overstate their profits equally, since the overstatement is a function of asset age structure, product cost structure and gearing. Industries with assets of relatively long life such as property companies and utilities will overstate their profits more seriously. Similarly, industries with relatively high depreciation and materials content in their product cost, such as capital intensive industries, will overstate their profits more than labour-intensive industries. Lastly, industries that are equity-financed will appear more profitable than debt-financed industries (since the latter omit the real profit on debt). These "boom industries" will appear more profitable and will therefore be over-expanded at the expense of "slump industries".

Distribution decisions are similarly biased towards over-distribution to shareholders (which may even include repayment of capital), higher real tax burdens[46], and higher wage and salary costs. Consumption increases in response to inflated profits, dividends and other incomes, thus reinforcing the inflationary process.

Within the firm, uncorrected accounting data create the same bias towards capital-intensive methods, long-lived assets, and equity financing.

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[46] It can be shown that if two firms have the same real profit, the one that charges the higher amount for depreciation and materials consumption will also show the higher profit after tax, despite a higher tax burden, where $1+i > 2t$ (i=the undercharge for maintenance of physical assets as a proportion of the uncorrected charge and t=the tax rate).

In Defence of Estate Duty

R. W. Maas

Introduction

Whatever posterity may think of Mr Barber's reign at the Treasury there is little doubt that he will be remembered as a reforming Chancellor. Last year's Finance Act introduced the unified system of personal taxation and also a new and far simpler system of capital allowances; this year's has given us VAT and the imputation system of corporation tax and he is already turning his mind to both negative income tax and an inheritance tax. Such a wholesale reform of almost the whole of the country's tax system must be unprecedented and leads one to speculate whether Mr Barber really felt, on taking office, that the country's entire tax system needed overhauling or whether some of the new taxes might merely represent change for change's sake. One might also be forgiven for speculating what effect, if any, Britain's aspirations towards membership of the European Economic Community have had on this massive programme of reform. VAT is being adopted throughout the EEC, the imputation system of corporation tax is already in use in France, and Mr Barber's next target for reform, an inheritance tax, is also a standard weapon in the tax armouries of the Common Market countries.

The proposal is that an inheritance tax should replace estate duty, which has been with us since 1894 and may not be in keeping with the needs of contemporary society. Perhaps 'proposal' is rather a strong word. The Chancellor professes to have an open mind on the subject. It is clear to anyone who knows anything about estate duty that it is badly in need of reform. The legislation has never been consolidated and is now spread over more than 50 different Acts. Some of the provisions are obscure or extremely complicated and opportunities for avoidance are so great that it has often been called a voluntary tax. In recent years attempts have been made to render the tax more effective but the effect of seeking to close the avenues of avoidance by tacking on new provisions to the almost ancient legislation is akin to that of Canute's seeking by his royal authority to repel the tide. If the need for reform of the estate duty legislation is accepted, as it surely must be, the thought as to whether the tax itself may have outlived its usefulness and might be replaced by an inheritance tax is not an unnatural one. Numerous variations are possible on either an estate duty or an inheritance tax and, in an attempt to ensure that the changes that are introduced take account of the views of all interested parties, the Chancellor has thrown the whole matter open for discussion. To encourage such discussion the Government have issued a green paper, 'Taxation of Capital on Death: a possible Inheritance Tax in place of Estate Duty' (Cmnd. 4930), which gives a brief summary of the present system of estate duty and some of its drawbacks and indicates possible forms that an inheritance tax might take. A consideration of inheritance tax, UK style, can accordingly be conveniently centred on this green paper, both because it deals with the main factors involved and because it would be churlish to refuse this aid to discussion which has been profferred by the Government.

The basic concept

Before considering the green paper, however, a consideration of the concept of an inheritance tax may not be amiss. An estate duty taxes a dead person on the value of the assets in his possession at the moment that he passes away from this world. It is perhaps a little symbolic – not even by dying can a man escape from the clutches of the tax gatherers. The power of the state stretches even to the grave (one might now even say into the grave as it is apparently the view of HM Customs and Excise that coffins attract VAT). An inheritance tax on the other hand taxes beneficiaries on the bequests that they receive. Instead of a person paying a tax for the privilege of dying, his heirs pay a tax for the joy of receiving their inheritances.

The logic of an estate duty seems to be that, if a person has accumulated assets during his lifetime, these will have come from his dealings with his fellow citizens and it is not unreasonable that a proportion of such assets should be returned to society. The logic of estate duty being at high rates is the traditional British sense of fair play and equality of opportunity. If a man has a greater amount of wealth than his neighbour (some people even feel that this should not be allowed to happen), it is fitting that the disparity should have arisen as a result of his own industry and effort and not that of his ancestors.

Whilst there is thus some logic in an estate duty, although in our case possibly tempered with a fair sprinkling of envy, it is difficult to see much logic behind an inheritance tax. If a person receives a bequest it will obviously increase his wealth and thus his ability to pay tax, but the mere fact that a person is able to pay a tax is hardly a valid reason for levying one. If the bequest is an unexpected windfall it certainly does not seem unreasonable for the state to share in a person's new-found prosperity. On the other hand, where a young child receives a share of the estate of a father on whom it was financially dependant, the state's claim to participate in this increment to the child's wealth is more difficult to justify. Of course, the distinction drawn in the tax system between income and capital is unreal and, if the state is entitled to share in a person's income, it should also be entitled to share in increments to his capital – but this is not an argument for an inheritance tax. An inheritance tax singles out one particular type of increment only. If the state lays no claim to any share in the increase in a person's assets due to gifts from relatives, football pool winnings or premium bond prizes, it is difficult to see why it should feel entitled to participate in an increase that comes from bequests from a deceased relative. Whilst a tax on capital increments would be logical, an inheritance tax seems no more logical than a tax on, say, salaries would be if all other income were tax free.

The green paper

Although logic in taxation is desirable it is by no means essential and thus this dismissal of the concept of an inheritance tax does not necessarily preclude an examination of its features – which brings us back to the green paper. This was undoubtedly a very difficult document to write and its authors deserve to be commended for the clarity they have achieved and the thoroughness with which they have managed to cover the subject in the brief space available. The result is unfortunately however susceptible to two major criticisms. Firstly, its criticisms of estate duty are to a large extent, if not entirely, directed against the particular system of estate duty that we have in this country at present rather than at the concept of estate duty as such. Secondly, its examples, although helpful in illustrating how an inheritance tax would work, compare the amount payable under an inheritance tax system with the amount payable under the present estate duty system. This is misleading and dangerous, as the fact that the examples generally show that the introduction of an inheritance tax will be beneficial could of itself attract people towards an inheritance tax. This benefit is largely illusory, however, because it arises from the particular rates of tax adopted for illustration purposes. These rates are far lower than those that will have to be introduced to maintain the present yield from estate duty. In fact it is stated in paragraph 70 of the green paper that the rates adopted for illustration purposes would produce up to 40 per cent less revenue than is obtained at present from estate duty. In the following paragraphs, frequent reference will be made to the green paper. No apologies are offered for this. The green paper is intended to form a basis for discussion and its content is worthy of thorough consideration. References below to either page or paragraph numbers are to the appropriate place in the green paper.

Criticisms of estate duty

The criticisms of estate duty, which are contained in paragraphs 23 to 27, look formidable in comparison with the advantages, which are the subject of only one paragraph (paragraph 27) containing less than eight lines. A detailed examination of the criticisms, however, indicates that they are directed at matters that are peculiar to the particular system of estate duty we have today.

The first criticism, that estate duty has become a growing burden by reason of the effect of inflation on property values, is mentioned in the green paper as a problem but the fact that it applies equally to inheritance tax or any form of taxation of capital is not pointed out. Although, probably tactfully, not mentioned in the green paper the rapacity of successive Chancellors has of course also contributed to the heavy burden of estate duty. Even with the effects of inflation it is improbable that anyone would consider estate duty a burden if the top rate of 8 per cent which applied from 1894 to 1907 still prevailed. Even during the war years, when income tax was at a peak, the top rate was only increased from 55 to 65 per cent, the top rate of 80 per cent which existed prior to the Finance Act 1972 being a purely post-war phenomenon.

The second point of criticism mentioned is that although the duty reduces the amount available to individual beneficiaries, its imposition is not related to the size of the legacy or the taxable capacity of the beneficiary. This gives rise to the question of the extent to which the devolution of a person's property should be the concern of the state. The natural unit in human society today is still the family and most people in their wills tend to divide the main part of their estate amongst their immediate family. Occasions do arise, however, particularly where a person has made *inter vivos* gifts, when a testator leaves his estate in a different manner. If, in the light of his individual set of circumstances, a testator does not feel that it would be appropriate to leave his assets to his immediate relatives, why should the amounts received by his beneficiaries be smaller than those of his neighbour who leaves his assets to his immediate family? Similarly a testator frequently feels a far greater sense of responsibility to a young or handicapped child than towards one who is able to support himself. Should not a person's disposition of his estate be determined primarily by his view of the needs of his relatives and friends? Should he be placed in the position where to give a greater proportion of his assets to his handicapped daughter than she would have been entitled to if he had divided his wealth equally amongst all his children would increase the overall tax liability? Why should the state decide that, for example, a person's wife is more dependant on him than is his mistress? Two elderly, but possibly completely unrelated, spinsters living together could well be more dependant on each other than a middle-aged husband and wife. Why should the state extract a larger amount of tax from them as compared with the married couple? Of course, an inheritance tax does not prevent a person disposing of his wealth as he wishes. The effect of different tax rates on bequests to different people is however likely to be borne in mind by testators particularly where the decision as to the most desirable recipient of a bequest is not clear cut, and this would surely be an unwelcome development. In passing, it might also be mentioned that Women's Lib may be faced with an awkward problem if an inheritance tax is introduced with different scales according to consanguinity. After campaigning so long against an income tax system which encourages people to 'live in sin', it will be interesting to see how they react towards a death duty system that penalises those who do so. In any event, if it is felt desirable for the State to interfere in this area, there is no reason why it cannot be done with an estate duty system by way of exempting all or some of the property devolving on specified classes of beneficiaries. In fact the Chancellor himself has shown that this is practicable by exempting, in the Finance Act 1972, a proportion of the property given to charity and that given to the surviving spouse. He has also shown in these provisions that it is feasible to ensure that the benefit of any exemption is obtained by the beneficiary concerned and not by the residuary legatees – although it must be admitted that the legislation to achieve this end is extremely complex.

A further area of criticism is that estate duty is chargeable on the property passing on death and does not take account of falls in value between the date of death and the date of distribution, or of expenses incurred in the administration of an estate. There seems no compelling reason why relief for these items should not be given in an estate duty system apart from the administrative problems, which have probably been exaggerated in the green paper and which, in any event, are no different with an inheritance tax system. It is stated that relief for administration expenses 'would run counter to the principle that estate duty is charged on the property passing on death' (paragraph 35). However this could equally be said of expenses incurred in agreeing values for capital gains tax purposes or for betterment levy, yet the Government found no difficulty in granting relief for such expenses.

The view expressed in the green paper (paragraph 24) that the criticisms considered above 'spring from the essential nature of the tax' seems at least open to question because, as indicated above, it appears possible to take account of them in any estate duty system. There are also other criticisms of estate duty which the green paper states derive from 'the rules associated with its administration'. It is not proposed to consider these further at this stage.

Inheritance tax

Having dealt with the major criticisms levelled against estate duty it might be worthwhile to consider now the characteristics of an inheritance tax and the problems associated with it. As stated in the green paper, an inheritance tax could take several forms. The main area of contention is whether, and how, it should include differentiation for consanguinity. As this differentiation is one of the major advantages claimed for an inheritance tax, it is difficult to envisage that the tax would be introduced without this feature. The green paper puts forward three possible methods of differentiation – one tax scale with different exemption allowances depending on the beneficiary's relationship to the deceased, different scales for different degrees of relationship, or one basic scale with tax being charged at a different proportion of the basic rates dependant on the relationship to the deceased. The first of these alternatives seems infinitely preferable as it is simple both to understand and operate and the burden on any one class of beneficiary can easily be varied by altering the exemption limit without having to recast the scale of tax rates. A major problem however is that such a system is likely to materially reduce the yield from the tax as, although it will produce differentiation in large estates, the exemption limits will almost certainly have to be so high as to exempt many estates from duty completely. Thus, if the case of a man leaving a wife and two children is considered as an example, it will be seen that, using the exemption figures assumed in paragraph 54, no tax need be payable at all if the deceased's estate is £70,000. At present such an estate would bear duty of £14,000.

The second possibility, separate scales, is cumbersome and is likely to give rise to administrative problems as three scales are less easy to remember than one. If the loss of tax inherent in the first alternative is not acceptable, one scale with tax being charged on a fraction of the standard rate would therefore be preferable to separate scales. It is stated in the green paper that this method suffers from lack of flexibility as 'it would not be possible to vary the proportionate benefits as between small and large estates'. This objection does not appear particularly strong as the graduation of the rates is itself designed to differentiate between large and small estates and there seems little justification for seeking to achieve the same objective when considering a system for differentiation according to consanguinity.

The other problem in differentiation according to consanguinity is the number of different scales or allowances to be used. A large number of different scales can be confusing and probably three would be adequate on the lines suggested in paragraph 54. It is not clear from this though into which scale parents would fall. As the general tendency is to leave substantial money to one's parents only where they are dependant on one, there is a certain amount of logic in including them in scale one, those most financially dependant on the deceased. A further point is grandchildren who are presumably in scale one but might be more appropriately included in scale two. The opportunities for avoidance if both one's children and grandchildren are in scale one are obvious. The possibility of treating husband and wife as one is also raised (paragraph 55). In view of the tendency in income taxation to depart from the concept of treating husband and wife as one it would probably be undesirable to introduce this concept into an inheritance tax. Also it would logically demand that, say, a son-in-law should be taxed on the same scale as a daughter which is probably undesirable. If one spouse is taxable under scale one and the other under scale three, this of itself provides a deterrent against splitting legacies between them purely to reduce the overall tax burden.

Rate of inheritance tax

It is difficult to make much progress on a consideration of inheritance tax without giving some thought to the probable rates at which it will be charged as the yield required must influence the form of the tax. For example, the rates assumed in the green paper would yield 40 per cent less revenue than estate duty if a comparatively simple form of tax is adopted. This is the system used by most countries who levy an inheritance tax. A more complicated form of tax would produce more income and would give a yield of only 25 per cent less than estate duty (see paragraph 70). To put the situation in perspective, if the Chancellor were prepared to accept a 40 per cent reduction in estate duty revenue under the existing system, he could make a straight across the board reduction of 40 per cent which would reduce the top rate of duty to 45 per cent – that is, below the pre-war level. Alternatively he could leave the top rates as they are and increase the exemption limit to around £50,000, which would take out of the charge to estate duty completely something like 80 per cent of estates chargeable at present. The effect of a 40 per cent reduction in estate duty for 1970–71 would have been equivalent to the abolition of capital gains tax or to a 60 per cent reduction in the rates of surtax or a reduction of 2½ percentage points in the rate of corporation tax.

No Chancellor would find it easy to dispense with this sort of revenue. Unfortunately a low yield appears to be a characteristic of inheritance taxes. This can be clearly seen from the table on page 11 of the green paper. The proportion of total taxes represented by inheritance tax in those countries which impose such a tax varies from 0·2 to 1·4 per cent with an average of 0·8 per cent. The comparative figures for those countries imposing an estate duty instead vary from 1·8 to 3·2 per cent with an average of 2·3 per cent. Even a 40 per cent reduction in the UK percentage of total taxes, from 2·5 to 1·5 per cent, would leave us taking a higher percentage of total taxes from death duties than any of the Common Market countries. The inference therefore must be that, if an inheritance tax is introduced, either exemption limits will be very low or tax rates will be high. The administrative problems of a very low exemption limit would be immense and the number of extra staff needed to cope with the tax might solve the unemployment problem 'at a stroke'. Even if a compromise of moderate exemption limits is introduced, the tax rates are likely to exceed those which at present apply for estate duty. Furthermore a straight across the board increase to the existing scale would not be possible as this would necessitate increasing the top rate to 125 per cent which would be impractical. If a top rate of 85 per cent is assumed to be the maximum acceptable, it would mean that no rate at present over 51 per cent could be increased by the full 40 per cent. On the basis of the scales set out on pages 33 and 34, this means that a disproportionate part of the necessary increase in rates would have to be borne by estates of under about £100,000. At present such estates produce around half of total estate duty revenue.

Aggregation of unrelated bequests

Under any system of inheritance tax it would be natural for any one beneficiary to have to aggregate all inheritances which he receives in respect of any one death in order to calculate the tax payable. Most, if not all, inheritance tax systems in operation at the present time contain such a provision but do not require any further aggregation. A more complicated system is also canvassed however in the green paper. This would require an inheritance to be aggregated with inheritances previously received by that beneficiary on other deaths. The mechanics of such an exercise are outlined in paragraphs 60 to 63. From reading this it will be seen that it is highly complex and is basically an anti-avoidance device (see paragraph 61). As, in the view of the authors of the green paper, the only practical method of operating such a tax would be to limit the period within which inheritances must be aggregated, it is not a particularly satisfactory anti-avoidance device though. The more logical method of aggregating bequests received throughout a person's life is dismissed as 'a most formidable task' (paragraph 60) although it is not clear why the records required would cause more difficulty than those that are required for graduated pension contributions, which are handled without apparent major difficulties. Even using a 10-year period, however, the administration would clearly be horrific and it is to be hoped that any UK inheritance tax does not take this form. Unfortunately the likelihood of having such a system is far from remote as the Treasury appear to have an overwhelming fear of tax avoidance and automatically incorporate extremely complicated anti-avoidance provisions in every new tax that is introduced. How simple the new corporation tax system could have been without advance corporation tax, which is basically an anti-avoidance device, for example.

It is difficult to see the logic in requiring a beneficiary to aggregate inheritances received on several deaths. As mentioned earlier, an inheritance tax itself is a basically illogical concept as it singles out one particular type of capital accretion whilst leaving others tax free. If it is merely looked on as a type of death duty, with the death as such giving rise to a tax charge, some sort of justification for the tax can be made out however. On the other hand, if the quantum of tax is to be determined not merely by reference to the death, but by reference to other deaths of entirely unrelated people, then it ceases to be a death duty and becomes little more than a lottery. Worse, it can be extremely unjust in operation. For example, John's father makes an *inter vivos* gift to him of £100,000 and five years later his mother dies leaving him £100,000. Using the table on page 33, John pays tax of £27,000. His friend Fred's father dies leaving Fred £100,000 and five years later Fred's mother dies leaving him a further £100,000. Fred pays tax of £27,000 on his father's bequest and £56,500 on his mother's bequest. Assuming that John and Fred are both minors, not many people would feel satisfied with a system that leaves John with £173,000 and a father to support him but leaves Fred, an orphan, with only £116,500. Or, to take another example, Peter's mother and a family friend, both of whom have left Peter money in their wills, are fatally injured in a car crash. Peter rushes to the hospital and sits anxiously waiting to see who dies first. If his mother dies first his total inheritance tax bill will be higher, perhaps substantially higher, than if she survives the friend by a few minutes. Or again Martin, who inherited £100,000 nine years ago and has lost everything in an unsuccessful business venture, receives £10,000 on the death of his aunt. His cousin Trevor, who won £100,000 on the football pools three weeks ago, receives a similar legacy. Martin, who needs the money, receives £5,000 after tax whereas Trevor, who doesn't, receives £10,000 as his legacy is below the exemption limit.

It must be admitted that such a tax would be likely to achieve its aim as an anti-avoidance device. Its operation is so capricious and the charge so erratic that to predict its effect with sufficient accuracy to take evasive action will be about as simple as getting eight score-draws on the treble chance. On second thoughts, bearing in mind the nation's apparently irresistible urge to give thousands of pounds to Littlewoods, Vernons and their colleagues, perhaps this might be the sort of tax we deserve.

Administration

The administrative problems associated with an inheritance tax are formidable. In paragraph 46 three features are listed which the authors of the green paper feel are pre-requisites of an inheritance tax. Firstly, tax would have to be paid by the executors and recouped by them from the beneficiary; secondly, executors and trustees would be under a statutory obligation to furnish full information necessary to assess and collect the tax; and thirdly, the tax would apply to gifts *inter vivos* within a given period such as seven years. Or, to put it another way, if we change from estate duty to an inheritance tax, for administrative purposes it would have to be treated as if it were an estate duty instead. Apart, that is, from the fact that a minimum of 200 extra staff, an increase of 20 per cent, would be needed to deal with it in the Estate Duty Office. This takes no account of the far larger number of extra staff that will be needed by solicitors, accountants and banks! The suggestion is also put forward that it may be necessary to require the tax to be paid in advance before probate is granted. If details of all inheritances received by all the beneficiaries within a period of 10 years prior to a death have to be ascertained before probate can be obtained, the delays that might be expected appear frightening. In this connection it is interesting to note that the list of people in paragraph 46(*b*) who would be under a statutory obligation to furnish information does not include beneficiaries. It also seems that beneficiaries will forfeit their rights to privacy regarding their financial affairs. If Aunt Mary dies and Uncle George is her executor does one admit to him that a bequest was received from Uncle Jim seven years earlier, and risk being cut out of Uncle George's will as a result, or does one disclaim the legacy from Aunt Mary and keep quiet about Uncle Jim?

Let us leave aside however the problems of collection and consider the far more interesting problems of valuation. 'The natural arrangement for an inheritance tax would be that the charge should be based on the values of property when the inheritance is received by (or becomes available to) a beneficiary' (paragraph 71). This is welcome news to holders of shares in private companies. If Joe leaves his 75 per cent holding in Bloggs Ltd. equally between his two children, valuations of two minority interests will be required (and, in the light of the view that the Shares Valuation Division of the Estate Duty Office appear to be taking of the Lynall decision, this is likely to mean very little tax will be payable). Or will there be an anti-avoidance provision so that we end up with an inheritance tax calculated, as well as collected, as if it were an estate duty? And what if an executor distributes shares in a private company to the beneficiaries on different days? That 200 additional staff will hardly cover the Share Valuation Division's requirements, let alone the whole Estate Duty Office! Similarly of course with other property. A person having two houses and two sons can save tax by leaving both to the two jointly, rather than one house to one son. Will the executor be able to reduce the tax bill by investing the whole estate in say agricultural property before distributing it to the beneficiaries? The possibilities are endless. Perhaps the Treasury are not obsessed with tax avoidance after all, if they would be prepared to countenance the tax being calculated by reference to the situation prevailing at the date of distribution. The possibilities with trusts created under a will are so far-ranging that they merit far more space than is available here. Suffice to say, or rather ask, whether we really want the sort of tax where 'it would seem necessary to impose an arbitrary charge on the capital of a discretionary trust' (paragraph 69). If a tax has to be arbitrary, does it really justify discussion? Is the price of an inheritance tax the abandonment of the traditional concept of fairness?

A final point concerning the administration of an inheritance tax that deserves consideration is the position of executors. Under an estate duty, values are fixed by the death, over which the executors have no control. With an inheritance tax, values depend on the dates of distribution to the beneficiaries, which are wholly in the hand of the executors. If the choice of a different date of distribution would have materially reduced a beneficiary's tax liability, the executor will be, at the least, embarrassed and could even find himself facing an action for negligence. This is a particular problem with quoted shares where the values are readily ascertainable. If prices are rising rapidly, a few days delay in, say, answering a letter might add pounds to the tax bill. On the other hand, if prices are unusually high, the executor would be open to criticism if he sought to distribute the assets without waiting for prices to regain their natural level. If the executor has a large block of shares in a small quoted company, some of which he has to sell to pay expenses and the remainder of which he must distribute to the beneficiaries, his own market dealings could even affect the price on which the tax comes to be calculated. *Caveat executor!* Perhaps potential executors should insist on a clause in the will exempting them from liability in such circumstances. But there may well be more to it than liability. If Uncle George distributes the assets of Aunt Mary's estate at the wrong time and increases the tax liabilities of the remainder of the family, life in the future could be a great deal less pleasant for him than in the past.

Conclusion

Although estate duty may not be a perfect tax, it seems to approach very near to it in comparison with an inheritance tax. Furthermore, there do not seem to be insuperable difficulties in amending it to meet the criticisms generally levelled against it. Inheritance tax on the other hand brings with it immense problems, the solutions to many of which are either extremely expensive in terms of administrative effort or unjust if a pragmatic approach is adopted and anomalies or arbitrariness accepted instead. It is accordingly to be hoped that rather than introduce an inheritance tax the Government will look afresh at estate duty. There are many ways in which this tax can be improved – for example, the 'surviving spouse exemption' should be amended to give relief on the first death rather than the second – but this is not the place to enter into a consideration of the changes that might be desirable to our existing estate duty system.

The Readability of Chairmen's Statements

M. D. Still

Over the last decade, there has been a movement towards simplification in the presentation of published accounts, in accordance with the policies of the professional bodies concerned. A vertical format is now by far the most common, and considerable use is made of sub-totals, descriptive headings and explanatory notes.[1] However, no comparable effort appears to have been made in Britain to improve the comprehensibility of chairmen's reports. This is perhaps surprising, because the information available in such reports is often essential to a proper assessment of the significance of the accounting data. Furthermore, readers having a minimal knowledge of accountancy presumably depend entirely upon the chairman's statement for their understanding of the company's affairs.

In the United States, rather more interest has been shown in the readability of corporate reports. One reason is undoubtedly the considerable extent of share ownership outside the upper and middle classes in America. Another is the American practice of negotiating far-reaching union-management contracts at fixed intervals, inevitably heightening the interest of payroll workers in the achievements and policies of their employers. It is, of course, conceivable that much wider share ownership may become a reality in Britain over the next few years; it is certain that, with the advent of productivity bargaining and widespread redundancy resulting from rationalization, British workers will increasingly wish to take an informed interest in their employers' affairs. Furthermore this interest is fostered by a growing recognition on all sides that employees should, as of right, be at least informed of developments likely to affect them.

This right to be informed has now received the stamp of government approval. S.56 of the Industrial Relations Act 1971 places upon employers the duty of disclosing to employees' representatives information which they need in connection with negotiations. The Industrial Relations Code of Practice issued under the Act states that 'management should regularly provide employees with information about:

(i) the performance and plans both of the establishment and, so far as they affect it, of the undertaking;

(ii) organizational and management changes which affect employees.'

Whilst the Code of Practice does not directly impose legal obligations, S.4 of the Industrial Relations Act requires that its provisions be taken into account in proceedings under the Act before the National Industrial Relations Court or an Industrial Tribunal. Furthermore, S.57 of the Act provides that employers may be compelled to issue to all their employees, within six months of the end of each financial year, a statement containing information required in accordance with regulations made by the Secretary of State, although no regulations have yet been made.

Against this background, the readability of chairmen's reports seems deserving of more attention. The number of financially unsophisticated shareholders may not increase, but it seems highly probable that growing numbers of employees will look to such reports for information which is generally unavailable to them elsewhere. This may well lead to problems in drafting reports that run counter to the prejudices neither of shareholders nor of employees.[2] But difficulties may also arise because reports written traditionally for the benefit of shareholders are misunderstood by readers less well-equipped to comprehend them. The remainder of this paper presents the findings of an investigation into the readability of annual reports made by the chairmen of British companies.

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[1] General Educational Trust of the Institute of Chartered Accountants in England and Wales, *Survey of Published Accounts*, 1969–70 (London, The Trust, 1971), pp. 14–15.

[2] T. K. Cowan, 'As Others See Us', *Accountants' Journal*, XLIX (July, 1971), pp. 451–55.

Readability and comprehension

The 'readability' of a passage of writing is a measure of the difficulty likely to be experienced in reading it. It depends to some extent on the layout of the pages, the style of type employed, and similar mechanical characteristics of the printed material. The interest of the reader in the passage may also be an important factor. Readability measurement, however, has concentrated mainly on the effects of linguistic form, and has been successfully applied in a wide variety of fields.

The first published research on readability appeared in 1928,[3] and subsequent interest in the topic can be judged from the fact that by 1950 no fewer than 34 formulas or methods had been devised for quantifying the reading difficulty level of printed material.[4] Nearly all these methods are based upon measurement of characteristics of written material which are known to be related to ease of comprehension. Typical characteristics (or 'difficulty factors') employed include frequency of prepositional phrases, sentence length, syllables per 100 words, number of different words, and word rarity. Measurements are combined in particular ways to yield scores which bear a closer relationship to ease of comprehension than that borne by any of the original measurements. Although at least 44 difficulty factors have been identified, a point of diminishing returns is rapidly reached when the measurements are combined, and virtually no improvement is obtained by using more than four.[5]

By far the most widely accepted method of assessing readability is that proposed by Flesch.[6] Although his method has since been somewhat improved upon,[7] so much of the work on readability has been based upon the Flesch formula that its use is almost imperative if findings are to be related to previous research. The 'new Flesch' formula (i.e. 1948) is accordingly that employed in this study.

The formula was devised using 363 passages of known difficulty level. The ease of comprehension of each was established on the basis of the grade levels of children who could correctly answer 75 per cent of questions concerning the passage. Flesch took measurements of average word length and sentence length and found the equation which combined them to yield the best estimate of the grade levels corresponding to each passage. The equation was then transformed so that instead of grade levels it yielded a reading ease score which ranged from 0 (most difficult) to 100 (least difficult). A score of 100 corresponds to a passage which can be read by the barely literate. The formula is:

$$\text{R.E. ('reading ease')} = 206{\cdot}835 - {\cdot}846\,wl - 1{\cdot}015\,sl$$

where wl = number of syllables per 100 words
sl = average sentence length.

The use of this formula in assessing the ease of comprehension of corporate reports has been validated to some extent in the United States.[8] A group of 42 readers, including persons trained and untrained in finance, both stockholders and non-stockholders, were tested for their comprehension of two corporate annual reports. One report had a reading ease score of 39, the other 16. The group as a whole made 73·2 per cent correct responses on a test of comprehension on the report having the higher score, and 62·4 per cent on the other. The subgroup who had no finance training and were not stockholders made 69 per cent correct responses on the easier report and 58 per cent on the other. A similar validation study[9] using passages from house journals indicated that the differences in comprehension test scores of passages having Flesch scores of 73 and 59 were statistically significant beyond the 1 per cent probability level.

The importance of interest in a passage as a determinant of ease of comprehension is widely accepted, and Flesch in fact devised a separate formula to estimate the 'human interest' of written material.[10] This characteristic has not been taken into account here, because of evidence that 'human interest' is unwelcome and may impede comprehension when it is regarded as irrelevant to the context as, for example, in technical literature.[11] In view of this it would have been impossible to assess the significance here of differences in human interest scores, the range of which would in any event probably have been small.

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[3] M. Vogel and C. Washburne, 'An Objective Method of Determining the Grade Placement of Children's Reading Material', *Elementary School Journal*, XXVIII (March, 1928), pp. 373–81.

[4] George R. Klare, 'Evaluation of Quantitative Indices of Comprehensibility in Written Communications' (Unpublished PhD thesis, University of Minnesota, 1950).

[5] W. S. Gray and B. E. Leary, *What Makes a Book Readable?* (Chicago: University Press, 1935).

[6] Rudolf Flesch, 'A New Readability Yardstick', *Journal of Applied Psychology*, XXXII (June, 1948), pp. 221–33.

[7] James N. Farr, James J. Jenkins and Donald F. Paterson, 'Simplification of Flesch Reading Ease Formula', *Journal of Applied Psychology*, XXXV, (October, 1951), pp. 333–37.

[8] Fred J. Soper and Robert Dolphin, Jr., 'Readability and Corporate Annual Reports', *Accounting Review*, XXXIX, April 1964, pp. 358–62.

[9] Charles E. Swanson and Harland G. Fox, 'Validity of Readability Formulas', *Journal of Applied Psychology*, XXXVII, April 1953, pp. 114–18.

[10] *Op cit.*

[11] George R. Klare, *et al.*, 'The Relationship of Style Difficulty to Immediate Retention and to Acceptability of Technical Material', *Journal of Applied Psychology*, XXXIX, (April, 1955), pp. 92–95.

Readability of British reports

A random sample of 50 company reports was obtained from those published during two months of 1971. The assets of these 50 companies totalled over £30,000 million, and they employed almost three-quarters of a million personnel between them.

Only the chairman's statement or chairman's report section of each publication was considered. In view of the amount of work involved in obtaining measurements relating to the whole of each report, a systematic sampling scheme was used. Starting at the beginning of the first complete paragraph of each page, the minimum number of successive complete sentences needed to yield samples of at least 100 words was taken. Numbers were included as one word for this purpose, and for that of calculating sentence lengths, but were eliminated from the samples before calculation of the number of syllables per 100 words. From the data relating to average sentence lengths and average word lengths, the Flesch reading ease score for each report was calculated using the formula given above.

The mean sentence length found in the 50 reports was 27·05 words, and an average of 161·9 syllables were used per 100 words. The highest Flesch reading ease score obtained was 71·9, the lowest, 18·0. The Flesch scores of the reports were found to be very nearly normally distributed with a mean of 42·51 and a standard deviation of 10·17. On the basis of this data, the proportions of British reports which might be expected to fall into each of the difficulty categories suggested by Flesch would be those listed in Table 1.

The significance of grade levels corresponding to each level of reading ease is that they enable some estimate to be made of the proportion of the population capable of reading and understanding the material concerned. 77 per cent of reports may be expected, from Table 1, to yield Flesch scores under 50, requiring a reading grade level of XIII *at least.* According to the *Population Characteristics* published by the US Department of Commerce, 80·7 per cent of American adults have not reached this level of educational attainment. Comparison of a variety of national statistics relating to education, particularly the distributions of years of schooling of the populations, suggests that the corresponding proportion of British adults is likely to be greater still.[12] The conclusion must be that a large majority of British reports are beyond the fluent comprehension of most employees of the companies concerned.

Implications

Even on the basis of readability scores, it appears that most reports to shareholders made by chairmen of British companies are likely to be found difficult or impossible to comprehend by a majority of employees. In interpreting scores for material such as company reports it should be borne in mind that the Flesch readability formula probably underestimates the extent of the difficulty, in view of the minimal importance ascribed by it to lengthy figures. In fact, the profusion of very large numbers in most reports may have a serious effect upon comprehension, directly through increasing confusion, and indirectly by inducing boredom. In addition, it is quite possible, of course, for a report to have a reading ease score typical of straightforward material and yet be ungrammatical, ill-punctuated and chaotically organized.

Although the difficulty level found in the British reports is surprisingly high, studies of US corporate reports have indicated a still more severe level of difficulty. One such study[13] concerned the reports of the 26 largest US companies (not a random sample). The reading ease scores (new Flesch) obtained ranged from 6 to 58, with an average of 34·47. A later investigation[14] of the reports of the same organizations disclosed a decline in mean reading ease score of 5·44 points, to 28·97, over the 1949–61

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[12] E. F. Denison, 'Measuring the Contribution of Education to Economic Growth', *The Economics of Education*, ed. E. A. G. Robinson and J. E. Vaizey (London: Macmillan, 1966), pp. 243–51.

[13] Siroon Pashalian and William J. Crissy, 'Corporate Annual Reports are Difficult, Dull Reading, Human Interest Value Low', *Journal of Accountancy*, XCIV, (August, 1952), pp. 215–19.

[14] Soper and Dolphin, *op. cit.*

TABLE I

Reading ease of reports written by the chairmen of British companies

Reading ease score	*Grade level**	*Description of style*	*Typical magazine*	*Estimated % of UK reports*
0–30	College graduate	Very difficult	Scientific	10·9
30–50	XIII to XVI	Difficult	Academic	66·1
50–60	X to XII	Fairly difficult	Quality	18·6
60–70	VIII to IX	Standard	Digests	4·1

* Pupils in US schools normally commence in the first grade and progress by one grade on the satisfactory completion of each year of education.

period. The substantial difference between this score and the average of 42·51 obtained in the present study is, however, partly explained by the inclusion in the American sample of six railway companies, whose reports have to meet particularly stringent US legal requirements. Notes to the accounts of US companies are evidently still more difficult to read; samples from those of the 50 largest US corporations in 1969 had an average Flesch score of 23·49.[15]

Whilst they may be easier to read than their American counterparts, the majority of British chairmen's reports will require considerable simplification if they are to provide a record of company policies and achievements which is comprehensible to employees. Individual managements may of course argue that whatever changes may be taking place in the sphere of industrial relations elsewhere, neither they nor their workers desire such a record: but a powerful case for simplification remains nevertheless. Because reports are written primarily for shareholders, items such as profits, dividends, rationalizations and so on are naturally accorded prominence. Points concerning these matters are usually made clearly and concisely, often in the first few lines. Taken out of context, however, as they are bound to be by anyone to whom the context is largely unintelligible, the remarks of many chairmen could prove very damaging to labour relations in the organizations concerned: exploited by the militant, their effect could be disastrous.

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[15] James E. Smith and Nora P. Smith, 'Readability: A Measure of the Performance of the Communication Function of Financial Reporting', *Accounting Review*, XLVI, (July, 1971), pp. 552–61.

Rates of Return under Uncertainty

K. N. Bhaskar

Introduction

The relationship between the accounting rate of return (ARR) and the internal rate of return (IRR) is examined in this paper. Although the research for this paper was completed before the publication of Livingstone and Salamon's[1] work, it appears to follow up further avenues of research suggested by them. They suggested that consideration could be given to factors like the use of alternative depreciation methods, the impact of changing prices, and the recognition of uncertainty. Hopefully, this paper is a step in the direction of considering these factors.

A discussion of the ARR should start with a specification of the purpose which this calculation is likely to serve. Ijiri[2] adopts the methodological point of view that accounting is a system for communicating the 'economic events' of an entity. Accounting statistics are a set of symbols which purport to measure the 'economic events'. The phenomena that are of primary importance, the 'economic events', are termed the principals, and surrogate is the name given to the 'thing' which represents the principal. An example illustrating this is the representation of the Earth's surface by a map; the Earth's surface would be the principal and a map would be the surrogate. In this paper the 'economic events' to be communicated are assumed to be the IRR of the assets that make up the firm. The ARR is assumed to be the surrogate that measures the principal (IRR).

The ARR at time t (ARR_t) is functionally related to a number of variables, viz: profits (before deducting depreciation) at time t (R_t), the historical cost of an asset (A_o), the estimated life of an asset (T), the time t, at which the ARR is being measured, and the method of depreciation (D). This can be summarised, using the notation above, in the following equation:

$$ARR_t = f(R_t, A_o, T, t, D) \qquad (1)$$

This paper uses a multiple asset model that was first used by Solomon and Laya.[3] The first section of the paper used this model in a deterministic environment, where the effect of different depreciation methods on the ARR is analysed for different rates of inflation and growth.

The second section incorporates an uncertain environment to the multi-asset model and uses it as the basis for some probabilistic simulation experiments. Two specific questions (among others) are raised throughout the paper: firstly whether assuming certainty a method of depreciation can be chosen which minimises the difference between the ARR and the IRR and secondly whether the answer to the first question remains unchanged in an uncertain environment.

Multi-asset model

The multi-asset model is essentially constructed of several identical assets (with regard to the pattern of cash flows over time). The cash flows of one such 'standardised' asset are: an initial outlay of £1,000 at the beginning of year 1 followed by six equal cash inflows (starting in year 1) of £229·61, assumed to occur at the end of the year. With no inflation and no growth all assets have this pattern of cash flows. Each year a new asset is bought by the hypothetical firm. This is balanced by the fact that after a certain number of years, a project will come to an end after running the length of its normal life. The model abstracts from the financing of the firm; the residual between cash inflows and the initial outlay may be considered as dividend if positive or equity financing if negative.

The results of these assumptions are to construct a model that has several assets, each asset being in a different stage of development. Table 1 defines the progress of the firm from its inception until the tenth year. Each row provides a description of the 'history' of an asset. The number of the row indicates the date at which the asset came into existence. The first row is numbered 0, indicating that this started its life at the very beginning of year 1. Reading along, this row describes the complete series of cash flows for this asset. After year 6, as can be seen from the first row, cash inflows are zero.

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[1] J. L. Livingstone and G. L. Salamon, 'Relationship between the Accounting and Internal Rate of Return Measures: A Synthesis and an Analysis', *Journal of Accounting Research*, 1970.

[2] Y. Ijiri, 'The Foundations of Accounting Measurement' (Prentice-Hall, Fre., 1967).

The next ten rows of Table 1 give the depreciation per year per asset. The straight-line method of depreciation is used. The asset is written off completely in six years; depreciation after the sixth year is zero. The next 10 years gives the book value of the assets at the end of the stated year. The summation at the foot of Table 1 gives the book value of the assets of the firm at the end of the year, the cash flows and depreciation for the year. Net profit is defined as cash flow less depreciation and ARR is defined as net profit divided by opening book value. To summarize:

$$\text{ARR}_t = \frac{\text{total cash inflow less depreciation for year t}}{\text{book value of assets at start of year t}}$$

This definition implies that the firm has no working capital, i.e. all income and expenditure apart from the cost of the asset is for cash. The ARR is shown along the bottom row of Table 1.

From year 6 onwards, the hypothetical firm can be said to be in equilibrium, for the firm has as many assets as an individual project has years of life. At year 6, there are six assets with cash inflows of £229·61 of which one has an initial outlay of £1,000. After year 6 the pattern is repeated because as one asset retires a new one comes into being.

Consequently from year 6 onwards, total cash flows remain at £1,377·64, and depreciation, net book value and net profit all stabilise to a constant amount. This result is due to the fact that at any point in time after year 5, the hypothetical firm has six assets, each in a different stage of development. The firm will continue to be in this situation for as long as the firm is in existence. The IRR of an asset is given by the solution to the following equation for r:

$$1{,}000 = 229{\cdot}61 \sum_{k=1}^{6} \frac{1}{(1+r)^k}$$

The solution to this equation is: $r = {\cdot}10$, i.e. the IRR is 10 per cent. The stabilised or equilibrium ARR found from year 6 onwards is 10·79 per cent.

This model was used by Solomon and Laya to examine the relationships between the equilibrium ARR and the IRR of the assets under varying conditions of growth and inflation. Growth is incorporated into the model by increasing the initial outlay for the asset acquired in year t by the factor $(1+g)^t$; the associated cash flows for this asset are increased by the same factor, that is, $229{\cdot}61\,(1+g)^t$. Since both the initial outlay and subsequent cash flows are increased by the same factor, the IRR of the asset is unchanged. Inflation can be incorporated into this model in a similar manner. The cash flows for year t are increased by the factor $(1+r)^t$ where r is the rate of inflation.

Although Solomon and Laya[3] presented the result of the inflationary and real growth cases separately, they did not combine inflation and growth. The cash flow of an asset commencing its life at time t is given by the following formula:

$$-(1+g)^t\,(1+r)^t\,1{,}000 + (1+g)^t\,(1+r)^{t+1}229{\cdot}61 + \;.\;.\;.\;.\;.\;.\;. + (1+g)^t\,(1+r)^{t+6}229{\cdot}61$$

or

$$-(1+g)^t\,(1+r)^t\,1{,}000 + (1+g)^t\;229{\cdot}61\;\sum_{k=1}^{6}(1+r)^{k+t}$$

where r is the rate of inflation. The real IRR remains at 10 per cent.

This model can be used to examine the relationships between the ARR, growth and inflation. Table 2 gives the equilibrium ARR for the multi-asset firm for various rates of growth and inflation. It will be recalled that the real IRR for all assets of the firm is 10 per cent. Each column of this matrix represents a set of equilibrium ARRs for a constant real growth rate and a varying inflation rate. The first column displays the appropriate ARRs for a −5 per cent growth rate and an inflation rate varying from −10 to 15 per cent; the first element of this column (−2·52 per cent) being the ARR for a −5 per cent real growth rate and a 10 per cent deflation rate. The last element of this column (32·74 per cent) represents the ARR for the hypothetical firm with a 15 per cent inflation rate and a −5 per cent growth rate.

Some analysis of this matrix might be helpful. The effect of growth alone may be considered by examining the row for the zero rate of inflation. With a growth rate of −5 per cent the equilibrium book yield is 11·27 per cent. It must be remembered that the real IRR of all assets or projects of the hypothetical firm remain at 10 per cent. As the rate of growth increases the ARR decreases. At a zero growth rate, the ARR is 10·79 per cent which is the same figure that was derived as the equilibrium ARR in Table 1. The ARR continues to decline to the end of the row. At a 10 per cent growth rate (i.e. where the growth

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[3] E. Solomon and J. C. Laya, 'Measurement of Company Profitability: Some Systematic Errors in the Accounting Rate of Return', in *Financial Research and Management Decisions*, ed. A. A. Robichek (Wiley, 1967).

TABLE 1

THE ACCOUNTING STATISTICS OF A HYPOTHETICAL FIRM WITH SUCCESSIVE INCREMENTS OF ONE THOUSAND POUNDS A YEAR

YEAR	0	1	2	3	4	5	6	7	8	9	10
CASH FLOWS INCLUDING INITIAL OUTLAYS											
0	-1000.00	229.61	229.61	229.61	229.61	229.61	229.61	0.00	0.00	0.00	0.00
1		-1000.00	229.61	229.61	229.61	229.61	229.61	229.61	0.00	0.00	0.00
2			-1000.00	229.61	229.61	229.61	229.61	229.61	229.61	0.00	0.00
3				-1000.00	229.61	229.61	229.61	229.61	229.61	229.61	0.00
4					-1000.00	229.61	229.61	229.61	229.61	229.61	229.61
5						-1000.00	229.61	229.61	229.61	229.61	229.61
6							-1000.00	229.61	229.61	229.61	229.61
7								-1000.00	229.61	229.61	229.61
8									-1000.00	229.61	229.61
9										-1000.00	229.61
10											-1000.00
DEPRECIATION											
0		166.67	166.67	166.67	166.67	166.67	166.67	0.00	0.00	0.00	0.00
1			166.67	166.67	166.67	166.67	166.67	166.67	0.00	0.00	0.00
2				166.67	166.67	166.67	166.67	166.67	166.67	0.00	0.00
3					166.67	166.67	166.67	166.67	166.67	166.67	0.00
4						166.67	166.67	166.67	166.67	166.67	166.67
5							166.67	166.67	166.67	166.67	166.67
6								166.67	166.67	166.67	166.67
7									166.67	166.67	166.67
8										166.67	166.67
9											166.67
NET BOOK VALUES											
0	1000.00	833.33	666.67	500.00	333.33	166.67	0.00	0.00	0.00	0.00	0.00
1		1000.00	833.33	666.67	500.00	333.33	166.67	0.00	0.00	0.00	0.00
2			1000.00	833.33	666.67	500.00	333.33	166.67	0.00	0.00	0.00
3				1000.00	833.33	666.67	500.00	333.33	166.67	0.00	0.00
4					1000.00	833.33	666.67	500.00	333.33	166.67	0.00
5						1000.00	833.33	666.67	500.00	333.33	166.67
6							1000.00	833.33	666.67	500.00	333.33
7								1000.00	833.33	666.67	500.00
8									1000.00	833.33	666.67
9										1000.00	833.33
10											1000.00
TOTAL NET BOOK VALUE		1000.00	1833.33	2500.00	3000.00	3333.33	3500.00	3500.00	3500.00	3500.00	3500.00
TOTAL CASH INFLOWS		229.61	459.21	688.82	918.43	1148.04	1377.64	1377.64	1377.64	1377.64	1377.64
TOTAL DEPRECIATION		166.67	333.33	500.00	666.67	833.33	1000.00	1000.00	1000.00	1000.00	1000.00
NET PROFIT		62.94	125.88	188.82	251.76	314.70	377.64	377.64	377.64	377.64	377.64
ACCOUNTING RATE OF RETURN		6.29	6.87	7.55	8.39	9.44	10.79	10.79	10.79	10.79	10.79

rate equals the IRR) the ARR is equal to the IRR. The reason for this result is given in Appendix A.

Summarising for the effect of growth alone, the ARR tends to overstate the IRR for rates of growth less than the IRR and understate it for rates of growth higher than the IRR.

The effect of inflation alone can be studied by examining the zero rate of growth column. A positive relationship is found to exist between the ARR and the rate of inflation. At a rate of deflation of 5 per cent the ARR is 4·38 per cent; this then rises to 10·79 per cent with no inflation; with a 15 per cent rate of inflation the ARR is 30·34 per cent. This can be summarised as the higher the inflation the higher the ARR. The column for the 10 per cent growth rate shows most clearly the effect of inflation, since with no inflation the ARR is 10 per cent precisely.

The money IRR (p) can be obtained by substitution in the following equation:

$$p=(1+r)(1+i)-1 \qquad (2)$$

where r=rate of inflation
and i=real IRR

Re-arranging and solving for i the above equation becomes:

$$i=\frac{(1+p)}{(1+r)}-1 \qquad (3)$$

If the ARR is used as a proxy for the money IRR (in the 10 per cent growth column) and uses the appropriate values of r (inflation rates) then i (the real IRR) is always equal to 10 per cent. In other words, the ARR correctly measures the money IRR at a 10 per cent growth rate. The ARR would always tend to overstate the real IRR in inflationary conditions because of the error introduced by adherence to the historical cost principle.

To facilitate the analysis of combined inflationary and growth situations, four different cases are considered:

(*a*) Inflation and low growth (less than 10 per cent) rates resulted in very high ARRs. An inverse relationship existed between growth and the ARR.
(*b*) Inflation and high growth (greater than 10 per cent) rates resulted in high ARRs but not as high as in case (*a*). Again the inverse relationship existed between growth and the ARR. The effect of inflation in increasing the ARR was greater than the effect of growth in reducing the ARR. Thus the ARR is always above 10 per cent.
(*c*) Moderate deflation (rates of between zero and 4½ per cent) coupled with the entire range of growth rates is similar to cases (*a*) and (*b*) except that the ARRs were in most cases below the IRR. The inverse relationship was still in evidence.
(*d*) Severe deflation (rates of greater than 4½ per cent) resulted in low ARRs. More extraordinary was the disappearance of the inverse relationship between the ARR and growth; instead there was a positive one. At the point where the relationship changed (e.g. 4·34 per cent rate of deflation), the ARR correctly measures the money IRR irrespective of the rate of growth.

Alternative depreciation methods

So far only the straight-line method has been calculated. However, as can be seen by the functional relationship:

$$ARR_t=f(R_t, A_o, T, t, D) \qquad (1)$$

the method of depreciation (D) has an effect on the ARR. Two different methods of depreciation, the annuity and reducing balance method, will now be considered to determine their effect. The interest rate used in the calculations for the annuity method was the IRR of the assets (10 per cent). The relevant rate of reduction for the reducing balance method was 30 per cent.*

The matrix presented in Table 2 showing the ARR for various situations was re-calculated using the annuity method of depreciation. This is shown in Table 3. With zero inflation the ARR accurately reflects the IRR irrespective of the rate of growth of the firm.

A difference between the ARR and the IRR only arises when inflation is taken into account. There is an inverse relationship between the ARR and the IRR for positive rates of inflation and a positive relationship for negative rates of inflation (i.e. deflation). It will be recalled that a similar relation was discovered for the straight-line method of depreciation except that the changeover from a negative to a positive relationship occurred at a deflation rate of 4½ per cent.

Thus the annuity method of depreciation produces an ARR that is a better approximation to the money IRR for rates of inflation (or deflation) that are closer to zero than to −4½ per cent, i.e. in Tables 2 and 3 from −2 per cent to +20 per cent. The straight-line method gives the better approximation only for rates of deflation of 3 per cent or more: rates that seem rather improbable in the UK!

The effect of the method of depreciation is summarized in Graph 1. The ARR is plotted against the growth rate for four different rates of inflation (+10 per cent, 0, −4·34 per cent and −10 per cent), each for three different methods of depreciation (straight-line, annuity and reducing balance). This

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*Since the asset used in the model has a nil scrap value it is not possible to calculate the rate using the accepted formula. However the rate of 30 per cent per year will result in a low scrap value after six years and therefore it is highly probable that firms would use such a rate. Also it is close to double the straight-line rate.

TABLE 2

ACCOUNTING RATES OF RETURN – CALCULATED BY USING THE STRAIGHT LINE METHOD OF DEPRECIATION

INFLATION RATE	REAL GROWTH RATE																				
	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
-10	-2.52	-2.40	-2.29	-2.17	-2.06	-1.96	-1.85	-1.75	-1.65	-1.55	-1.45	-1.36	-1.26	-1.17	-1.09	-1.00	-.92	-.83	-.75	-.68	-.60
-9	-1.17	-1.07	-.97	-.88	-.78	-.69	-.61	-.52	-.44	-.35	-.27	-.20	-.12	-.04	.03	.10	.17	.24	.30	.37	.43
-8	.20	.27	.35	.43	.50	.57	.64	.71	.78	.84	.90	.97	1.03	1.09	1.14	1.20	1.26	1.31	1.36	1.41	1.46
-7	1.56	1.62	1.68	1.73	1.79	1.84	1.89	1.94	1.99	2.04	2.08	2.13	2.17	2.22	2.26	2.30	2.34	2.38	2.42	2.46	2.49
-6	2.94	2.97	3.01	3.04	3.08	3.11	3.14	3.17	3.20	3.23	3.26	3.29	3.32	3.35	3.37	3.40	3.43	3.45	3.47	3.50	3.52
-5	4.31	4.33	4.34	4.36	4.37	4.38	4.40	4.41	4.42	4.43	4.44	4.46	4.47	4.48	4.49	4.50	4.51	4.52	4.53	4.54	4.55
-4	5.70	5.69	5.68	5.67	5.67	5.66	5.65	5.65	5.64	5.63	5.63	5.62	5.62	5.61	5.61	5.60	5.59	5.59	5.59	5.58	5.58
-3	7.08	7.05	7.02	6.99	6.97	6.94	6.91	6.89	6.86	6.84	6.81	6.79	6.76	6.74	6.72	6.70	6.68	6.66	6.64	6.62	6.60
-2	8.47	8.42	8.37	8.32	8.27	8.22	8.17	8.13	8.08	8.04	8.00	7.95	7.91	7.88	7.84	7.80	7.76	7.73	7.69	7.66	7.63
-1	9.87	9.79	9.72	9.64	9.57	9.50	9.44	9.37	9.31	9.24	9.18	9.12	9.06	9.01	8.95	8.90	8.85	8.80	8.75	8.70	8.65
0	11.27	11.17	11.07	10.97	10.88	10.79	10.70	10.61	10.53	10.45	10.37	10.29	10.22	10.14	10.07	10.00	9.93	9.87	9.80	9.74	9.68
1	12.68	12.55	12.43	12.31	12.19	12.08	11.97	11.86	11.76	11.66	11.56	11.46	11.37	11.28	11.19	11.10	11.02	10.93	10.85	10.78	10.70
2	14.08	13.93	13.79	13.64	13.51	13.37	13.24	13.11	12.99	12.86	12.75	12.63	12.52	12.41	12.30	12.20	12.10	12.00	11.91	11.81	11.72
3	15.50	15.32	15.15	14.98	14.82	14.66	14.51	14.36	14.21	14.07	13.94	13.80	13.67	13.54	13.42	13.30	13.18	13.07	12.96	12.85	12.74
4	16.92	16.71	16.52	16.33	16.14	15.96	15.78	15.61	15.45	15.28	15.13	14.97	14.82	14.68	14.54	14.40	14.27	14.14	14.01	13.89	13.76
5	18.34	18.11	17.89	17.67	17.46	17.26	17.06	16.87	16.68	16.50	16.32	16.15	15.98	15.81	15.65	15.50	15.35	15.20	15.06	14.92	14.79
6	19.76	19.51	19.26	19.02	18.78	18.56	18.34	18.12	17.91	17.71	17.51	17.32	17.13	16.95	16.77	16.60	16.43	16.27	16.11	15.96	15.81
7	21.19	20.91	20.63	20.37	20.11	19.86	19.61	19.38	19.15	18.92	18.70	18.49	18.29	18.09	17.89	17.70	17.52	17.34	17.16	16.99	16.82
8	22.62	22.31	22.01	21.72	21.44	21.16	20.90	20.64	20.38	20.14	19.90	19.67	19.44	19.22	19.01	18.80	18.60	18.40	18.21	18.02	17.84
9	24.06	23.72	23.39	23.08	22.77	22.47	22.18	21.89	21.62	21.35	21.09	20.84	20.60	20.36	20.13	19.90	19.68	19.47	19.26	19.06	18.86
10	25.50	25.13	24.78	24.43	24.10	23.78	23.46	23.16	22.86	22.57	22.29	22.02	21.75	21.49	21.24	21.00	20.76	20.53	20.31	20.09	19.88
11	26.94	26.55	26.16	25.79	25.44	25.09	24.75	24.42	24.10	23.79	23.49	23.19	22.91	22.63	22.36	22.10	21.85	21.60	21.36	21.12	20.90
12	28.38	27.96	27.55	27.16	26.77	26.40	26.03	25.68	25.34	25.01	24.68	24.37	24.06	23.77	23.48	23.20	22.93	22.66	22.41	22.16	21.91
13	29.83	29.38	28.95	28.52	28.11	27.71	27.32	26.95	26.58	26.23	25.88	25.55	25.22	24.91	24.60	24.30	24.01	23.73	23.45	23.19	22.93
14	31.29	30.81	30.34	29.89	29.45	29.02	28.61	28.21	27.82	27.45	27.08	26.72	26.38	26.04	25.72	25.40	25.09	24.79	24.50	24.22	23.95
15	32.74	32.23	31.74	31.26	30.79	30.34	29.90	29.48	29.07	28.67	28.28	27.90	27.54	27.18	26.84	26.50	26.17	25.86	25.55	25.25	24.96

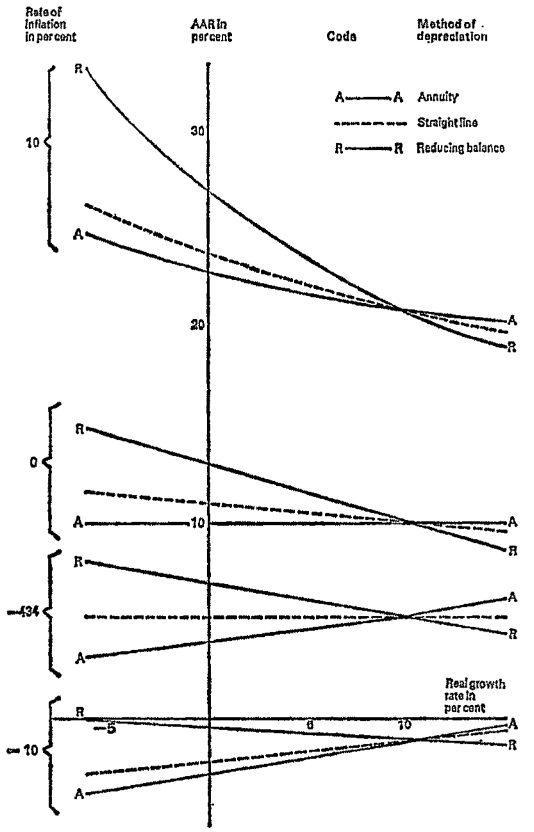
TABLE 3

ACCOUNTING RATES OF RETURN – CALCULATED BY USING THE ANNUITY METHOD OF DEPRECIATION

INFLATION RATE	REAL GROWTH RATE																				
	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
-10	-3.58	-3.38	-3.19	-3.00	-2.81	-2.63	-2.45	-2.27	-2.10	-1.93	-1.77	-1.61	-1.45	-1.30	-1.15	-1.00	-.86	-.72	-.58	-.44	-.31
-9	-2.25	-2.07	-1.89	-1.72	-1.54	-1.38	-1.21	-1.06	-.90	-.75	-.60	-.45	-.31	-.17	-.03	.10	.23	.36	.48	.60	.72
-8	-.91	-.75	-.59	-.43	-.28	-.13	.02	.16	.30	.44	.57	.71	.83	.96	1.08	1.20	1.32	1.43	1.54	1.65	1.76
-7	.44	.58	.72	.86	1.00	1.13	1.26	1.39	1.51	1.63	1.75	1.86	1.98	2.09	2.19	2.30	2.40	2.50	2.60	2.70	2.79
-6	1.79	1.91	2.04	2.16	2.27	2.39	2.50	2.61	2.72	2.82	2.92	3.02	3.12	3.22	3.31	3.40	3.49	3.58	3.66	3.74	3.82
-5	3.14	3.25	3.35	3.45	3.55	3.65	3.74	3.84	3.93	4.01	4.10	4.18	4.27	4.35	4.42	4.50	4.57	4.65	4.72	4.79	4.86
-4	4.50	4.59	4.67	4.76	4.84	4.91	4.99	5.06	5.14	5.21	5.28	5.35	5.41	5.48	5.54	5.60	5.66	5.72	5.78	5.83	5.89
-3	5.87	5.94	6.00	6.06	6.12	6.18	6.24	6.30	6.35	6.40	6.46	6.51	6.56	6.61	6.65	6.70	6.75	6.79	6.83	6.87	6.92
-2	7.24	7.29	7.33	7.37	7.41	7.45	7.49	7.53	7.57	7.60	7.64	7.67	7.70	7.74	7.77	7.80	7.83	7.86	7.89	7.92	7.94
-1	8.62	8.64	8.66	8.68	8.70	8.72	8.74	8.76	8.78	8.80	8.82	8.83	8.85	8.87	8.88	8.90	8.92	8.93	8.94	8.96	8.97
0	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
1	11.39	11.36	11.34	11.32	11.30	11.28	11.26	11.24	11.22	11.20	11.18	11.17	11.15	11.13	11.12	11.10	11.08	11.07	11.05	11.04	11.03
2	12.78	12.73	12.69	12.64	12.60	12.56	12.52	12.48	12.44	12.40	12.37	12.33	12.30	12.26	12.23	12.20	12.17	12.14	12.11	12.08	12.05
3	14.17	14.10	14.03	13.97	13.90	13.84	13.78	13.72	13.66	13.61	13.55	13.50	13.45	13.40	13.35	13.30	13.25	13.21	13.16	13.12	13.08
4	15.57	15.48	15.39	15.30	15.21	15.13	15.05	14.97	14.89	14.81	14.74	14.67	14.60	14.53	14.46	14.40	14.34	14.28	14.22	14.16	14.10
5	16.97	16.85	16.74	16.63	16.52	16.42	16.31	16.21	16.11	16.02	15.93	15.84	15.75	15.66	15.58	15.50	15.42	15.34	15.27	15.20	15.12
6	18.38	18.24	18.10	17.96	17.83	17.71	17.58	17.46	17.34	17.23	17.12	17.01	16.90	16.80	16.70	16.60	16.50	16.41	16.32	16.23	16.15
7	19.79	19.62	19.46	19.30	19.15	19.00	18.85	18.71	18.57	18.44	18.31	18.18	18.05	17.93	17.81	17.70	17.59	17.48	17.37	17.27	17.17
8	21.20	21.01	20.82	20.64	20.46	20.29	20.12	19.96	19.80	19.65	19.50	19.35	19.21	19.07	18.93	18.80	18.67	18.55	18.43	18.31	18.19
9	22.62	22.40	22.19	21.98	21.78	21.59	21.40	21.21	21.03	20.86	20.69	20.52	20.36	20.20	20.05	19.90	19.75	19.61	19.48	19.34	19.21
10	24.05	23.80	23.55	23.33	23.11	22.89	22.67	22.47	22.27	22.07	21.88	21.69	21.51	21.34	21.17	21.00	20.84	20.68	20.53	20.38	20.23
11	25.47	25.20	24.94	24.68	24.43	24.19	23.95	23.72	23.50	23.28	23.07	22.87	22.67	22.47	22.28	22.10	21.92	21.75	21.58	21.41	21.25
12	26.90	26.60	26.31	26.03	25.76	25.49	25.23	24.98	24.73	24.50	24.27	24.04	23.82	23.61	23.40	23.20	23.00	22.81	22.63	22.45	22.27
13	28.33	28.01	27.69	27.38	27.08	26.79	26.51	26.24	25.97	25.71	25.46	25.21	24.98	24.74	24.52	24.30	24.09	23.88	23.68	23.48	23.29
14	29.77	29.42	29.07	28.74	28.41	28.10	27.79	27.50	27.21	26.93	26.65	26.39	26.13	25.88	25.64	25.40	25.17	24.95	24.73	24.51	24.31

ALL RATES ARE EXPRESSED AS A PERCENTAGE PER ANNUM graph neatly summarizes the three firm conclusions that can be derived from the deterministic model.

GRAPH 1



(1) With all methods of depreciation the ARR of the firm is equal to the IRR of the underlying assets when the firm's growth rate equals the IRR.
(2) With the straight-line method of depreciation the firm's ARR is equal to the money IRR of the underlying assets for all rates of growth when the rate of inflation is —4·34 per cent.

With the annuity method the same is true when the rate of inflation is zero. Thus the annuity method gives the closer approximation when the rate of inflation is closer to zero than to —4·34 per cent, the normal situation in the UK.
(3) In all cases (except for a growth rate of 10 per cent) the reducing balance method of depreciation gives a poorer approximation to the IRR than other depreciation methods.

Probabilistic results

Harcourt[4] considered the discrepancy between the ARR and the IRR for a hypothetical firm for the reducing balance and straight-line methods of depreciation. It was seen that, in the example under consideration, neither the reducing balance nor the straight-line method was particularly efficient in minimising this discrepancy. The annuity method coupled with a zero rate of inflation seemed to achieve this. For positive rates of inflation the annuity method performed better than the two other methods of depreciation in minimising the divergence between the money IRR and the ARR. In addition it was seen that the straight-line method was better than the reducing balance (at a 30 per cent rate) method of depreciation. These conclusions were drawn in a world of perfect knowledge and a completely specified environment.

These are the 'Golden Age' conditions mentioned by Harcourt[4] and others. It was thought that the 'Golden Age' barrier might be broken by letting certain variables become stochastic in the hypothetical firm (which consists of seven assets, each identical, and each with a six-year life) and monitoring the resulting effect of uncertainty on the ARR for different depreciation methods. Under conditions of certainty, the annuity method of depreciation was found to be the method of depreciation that equated the ARR and the IRR (assuming no inflation). The probabilistic multi-asset model was run in order to test the following hypothesis: if uncertainty was included in the model, would the depreciation methods that performed best in the conditions of certainty perform as well (relative to other methods of depreciation) in a world of uncertainty? To simplify the analysis only the no-growth, zero inflation case was considered.

In order to test this hypothesis, it seemed logical to use the multi-asset model that was the basis for the earlier conclusions. The model is the same hypothetical firm consisting of six assets each in a different stage of development and each asset having a six-year life. It was decided to introduce uncertainty in three different stages of severity. All three stages involved letting the value of the cash inflow and the life of an asset behave in a stochastic fashion. The cash inflows were given a normal probability distribution with a mean of 229·61 and a standard deviation of one-sixth this amount (38·2). The mean and the standard deviation together then completely defined the remainder of the distribution. Similarly the life of the asset's cash inflow was given a normal distribution with a mean of 6 and a standard deviation of 1 (one sixth of the mean).

The three different ways of introducing uncertainty in the multi-asset model were called experiments one, two and three. In experiment one, the cash inflows of each asset were independent over time, and in addition the cash inflows of each asset were independent from asset to asset. This implies a low degree of risk for if the cash inflow of an asset is low in any one year, it may recover to a higher level in the following year. Also if the cash inflow for one asset is low, another asset may have a high cash inflow.

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[4] G. C. Harcourt, 'The Accountant in a Golden Age' (Oxford Economic Papers, 1965).

Experiment two also assumed that the cash inflows were independent from asset to asset, but unlike experiment one, the cash inflows were assumed to be perfectly correlated over time. This assumption increased the variability of the IRR of an asset, for whatever happened to an asset in the first year of its existence would determine the future stream of cash inflows. In experiment one, a small cash inflow in the first year is less disastrous because the cash inflow in the third year may be larger.

Experiment three (as did experiment two) assumed that cash inflows were perfectly correlated over time, but in addition (and unlike experiments one and two) the cash inflows from asset to asset were perfectly correlated. This last assumption implied that the cash inflow for each asset was the same as another asset for any particular year. When this assumption is added to the assumption about perfect correlation over time (of cash inflows) then the result was that each asset had the same cash inflow for the entire life of the firm. This meant that if the cash inflow for a firm was low, then it was low for all assets and for all years. This further increased the variability of the IRR of all the assets of the firm, for previously if one asset had a low IRR, another asset may have had a high IRR. Thus on average the IRR for all the assets would not deviate too much.

For all the experiments the degree of 'riskiness' was increased by doubling the standard deviations of the cash inflow and life from 38·2 to 76·4 (cash inflow) and from 1 to 2 (life of cash inflow) respectively.

For all the above states of introducing a controlled amount of uncertainty into the model, it was assumed that the life of an asset was independent of the lives of the firm's other assets. In analysing the result of uncertainty on the firm, the firm was assumed to be in 'equilibrium', that is, at any point in time, the firm would have six assets if the firm was placed in an environment of complete certainty. (Equilibrium occurs from year 6 onwards).

A computer programme was written to simulate the accounts of a firm under these conditions. A full description of the programme is given in Appendix B. The programme calculated the mean and standard deviation of the IRR of the firm's assets, and the same statistics for the firm's ARR for the three different methods of depreciation.

The results of the computer runs are summarized below.

Experiment one

(Cash inflows independent over time and also independent from asset to asset).

The results of this experiment are shown in Table 4. This experiment was set up to produce the smallest dispersion of IRRs out of all three experiments. This was the only distribution that had its smallest value greater than zero. (It was, in fact, 1·83.) The annuity distribution had the closest mean and nearest standard deviation to the IRR distribution. Nevertheless, the standard deviation of the annuity distribution was nearly three times as large as the standard deviation of the IRR distribution.

The results of experiment one were disappointing, for apart from the means, the widest all-round divergence between the IRR and the ARR distributions occurred in experiment one. Although the annuity method of depreciation would appear to minimise the difference between the two distributions, the difference between the annuity and the straight-line distribution was not very marked on a relative or an absolute scale. (The mean was only ·71 greater, and the standard deviation is only ·4 greater.)

Graph 2 shows the frequency distributions for the IRR and of the ARR using the annuity method. The straight-line distribution (not shown) is markedly similar to the annuity distribution. Of the three ARR distributions, the annuity distribution is closest to the IRR distribution. Even then, apart from the two highest points occurring in the same interval, there was little resemblance between these two distributions. This illustrates the distribution between the ARR and the IRR of a hypothetical firm in this type of environment.

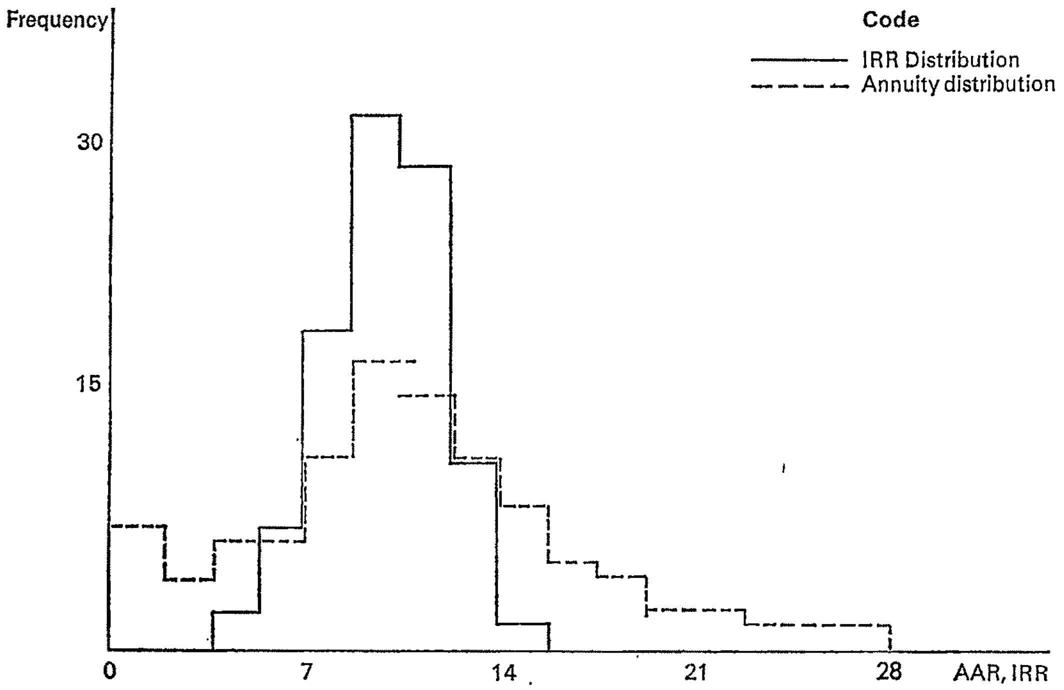
Experiment two

(Cash inflows perfectly correlated over time, but still independent from asset to asset.)

TABLE 4 *(Experiment one)*

		Mean	*Standard deviation*	*Highest value*	*Lowest value*
	IRR	9·88	2·03	16·2	1·8
ARRs	Annuity	10·69	5·65	31·9	0
	Straight-line	11·40	6·05	34·5	0
	Reducing balance	13·39	6·33	34·8	0

GRAPH 2



The results of this experiment are shown in Table 5. This experiment was designed so that the variability of the IRR distribution would be larger. The standard deviation of the IRR distribution increased from 2·03 in experiment one to 2·9 in experiment two. The means and standard deviations of the three ARR distributions are similar to those found in experiment one. This implies that since the standard deviation of the IRR distribution has increased, the variability of the IRR distribution is more accurately measured by the ARR distributions than it was in experiment one – though the standard deviation of the annuity distribution was double that of the IRR distribution. The annuity and straight-line distributions were, again, markedly similar, but neither bore much resemblance to the IRR distribution. There was, however, one surprising result. The reducing *balance* distribution had the smallest (38·5) highest value from all the ARR distributions.

TABLE 5 *(Experiment two)*

		Mean	*Standard deviation*	*Highest value**
	IRR	9·94	2·90	22·7
ARRs	Annuity	10·75	5·76	39·5
	Straight-line	11·47	6·17	42·3
	Reducing balance	13·49	6·56	38·5

* Lowest value for all distributions was zero.

Experiment three

(Cash inflows perfectly correlated over time and perfectly correlated from asset to asset.)

This experiment, the results of which are shown in Table 6, was designed to produce the most volatile IRR and ARR distributions. Despite this the standard deviations and the highest values of the ARR distributions were closest to those of the IRR distribution. The means of the ARR distribution, however, were higher than the previous two experiments. The annuity distribution was clearly better than the other two ARR distributions. The shapes of all three book-yield distributions were not only similar but they, for the first time, vaguely resembled the IRR distribution. The closest 'fit' to the IRR distribution was obtained by the annuity distribution. Although on an absolute scale the resemblance between these two distributions may not be marked, it was the closest that was obtained during all three experiments.

TABLE 6 *(Experiment three)*

		Mean	*Standard deviation*	*Highest value**
	IRR	10·02	5·79	30·4
ARRs	Annuity	11·38	7·86	43·9
	Straight-line	12·11	8·45	47·0
	Reducing balance	14·28	9·51	50·2

Correlation between ARR and IRR distributions

The distributions for the IRR and ARR given above are the result of 1,000 observations of a probabalistic simulation model. It is possible to regress the observations of the IRR against those for the ARR to determine the nature of the functional relationship that exists between these two figures. The model used was:

$$\mathrm{ARR}=\mathrm{a}+\mathrm{bIRR}+\mathrm{u}$$

Table 7 gives the estimates for a and b in this model for the different experiments.

If the ARR reflected the IRR perfectly, the following results would be expected: the estimates of a and b should be zero and one respectively, the correlation coefficient should be one, and there should be a zero standard error of estimate. If the estimate of the slope (*b*) was negative, this result would indicate an inverse relationship between the IRR and the ARR. Fortunately it transpired that all the estimates indicated a positive relationship between the ARR and the IRR.

Surprisingly as the degree of riskiness increased from experiment one to three, the intercepts of the regression equations approached zero, the slopes approached one, the correlation coefficients were higher, and the standard error of estimate decreased. A cursory analysis of Table 7 is sufficient to indicate that the results of the straight-line method of depreciation were always dominated by the annuity method. The straight-line method of depreciation will not be discussed further. After comparing the results of the two other methods of depreciation, it was found that the annuity method had smaller slopes whilst the reducing balance method had smaller standard errors (of estimates) and higher correlation coefficients. This is indicative of the fact that there existed a closer relationship between the IRR and the book yield using the reducing balance method of depreciation, though the penalty that was paid for this was a worsening in the slope (steeper slope) making the book yield more sensitive to small changes in the IRR of estimate.

As the riskiness of the environment – as measured by the variability of the IRR distribution – increases, so the relationship between the ARR and the IRR becomes closer. In experiment three it would appear that the slope was close to one (+1·35 for the annuity distribution) and the ARR might be used, with caution, as a reasonable surrogate for the IRR. The same can hardly be said for the results of experiment one, even though the correlation coefficient was fairly high.

Rather than use the ARR as a surrogate for the IRR, a (hypothetical) management would do better, when faced with an observed book yield, to do the following: decide which of the three experiments his firm is in, choose the relevant estimates of a and b (denoted as α and β respectively) and solve equation (3) for the estimated IRR.

If $\mathrm{ARR}=\alpha+\beta\mathrm{IRR}$

$$\text{then } \hat{\mathrm{IRR}}=\frac{\mathrm{ARR}-\alpha}{\beta} \tag{5}$$

The $\hat{\mathrm{IRR}}$ derived from this last equation would be a much better estimate of the actual IRR than the ARR. There is only one problem with this; the management would presumably also have the cash flows of the assets and thus be able to work out the IRR from the cash flows directly.

It would be nice to think that the equation (5) could be used in the real world, but this would be foolhardy, since there are so many assumptions involved in building the model used here that might not be borne out in the real world.

The fact that the estimates of b were all considerably greater than one, means that any variation of the IRR from the expected IRR would result in a much greater variation in the ARR. Denoting by Δ

TABLE 7

	Estimate of a *(Intercept)*	 b *(Slope)*	*Standard error of estimate*	*Correlation coefficient*
Experiment one				
Annuity	−16·15	+2·72	1·25	+·975424
Straight-line	−17·21	+2·90	1·42	+·972285
Reducing balance	−16·97	+3·07	1·05	+·986153
Experiment two				
Annuity	− 8·75	+1·96	·95	+·986242
Straight-line	− 9·31	+2·09	1·16	+·982084
Reducing balance	− 8·85	+2·25	·77	+·993120
Experiment three				
Annuity	− 2·12	+1·35	1·04	+·991285
Straight-line	− 2·37	+1·41	1·21	+·989648
Reducing balance	− 2·10	+1·63	·99	+·994586

'a small change in':

$$\Delta ARR = b\Delta IRR$$

Since the estimate of b is nearly 3 in experiment one, 2 in experiment two and around $1\frac{1}{2}$ in experiment three, any variation in the IRR will affect the observed ARR to a much greater extent.

A comment on the poor performance of the ARR in experiment one

The ARR performed badly in experiment one because of the assumptions made (which were, independent of cash inflows both over time and from asset to asset). The ARR is a 'short-sighted' statistic, information about the past and future being irrelevant in its calculation. Assuming that cash inflows are independent over time means that if the cash inflow is low in any particular year, this result would be reflected in a low ARR (*ceteris paribus*), even though for all the other years of the asset's life the cash inflows may be above average (and yielding an above average IRR). This explanation could account for the improvement in the fit of the regression line between experiments one and two. (In experiment two cash inflows were assumed to be perfectly correlated over time.) The improvement of the results between experiments two and three seems to be caused by the ARRs' extreme sensitivity to changes in the cash inflow. They react in a very volatile fashion, and if the environment also reacts in a volatile manner then there would appear to be a closer relationship between the ARR and the IRR.

Doubling the standard deviations

The results are shown below in Table 8:

In general the means were higher and the distortion greater. The annuity distribution still had the closest results to the IRR distribution. The mean of the reducing balance distribution was actually lower in experiment two (a higher 'risk' situation) than in experiment one. The correlation coefficients (not shown) were slightly lower than previously, being about 0·02 lower in experiment one, though the difference was negligible in experiment three. This part of the experiment seemed to confirm the earlier tendencies.

Summary of probabilistic results

The three experiments were designed so that uncertainty was most severe in experiment three and least severe in experiment one. ('Uncertainty' is narrowly defined here as the variability of the IRR distribution.) It was, therefore, a surprise to discover that the ARR became better (as a statistic for measuring the IRR) as uncertainty increased. To be fair, better, in this context can only be defined on a relative scale, for on any absolute scale the ARR (in these probabilistic experiments) proved to be a statistic which did not closely represent the IRR.

Of the three depreciation methods, the annuity method seemed to produce the (ARR) distribution with the closest mean and standard deviation to that of the IRR distribution. The straight-line distribution was very similar to that of the annuity distribution, though its dispersion was slightly greater and its mean slightly higher. But for practical use there seems little to choose between the two distributions, although the findings of this paper indicate that the annuity method of depreciation would always yield results that were slightly closer to the IRR. The reducing balance method of depreciation was found to be, on all occasions, rather poor, but it was not without its virtues; it produced the distribution that had the closest fit to the IRR distribution, and had the lowest 'highest value' in experiment two. In the determinist section, the annuity method of depreciation seemed to be the undisputed champion of the three depreciation methods investigated. By taking the very simplest case (zero real growth and zero inflation) uncertainty was introduced by letting certain variables behave in a stochastic fashion. From the analysis of the probabilistic results, it can be argued that the annuity method of depreciation may not have such a great advantage in an uncertain world as it had in a completely deterministic world. Although the annuity method may have been the best method, its rivals were not far behind.

The assumptions of the model make the findings of this section of the paper of limited application for, apart from the general assumptions of the model, a constant cash inflow stream (with no real growth and no inflation) has been assumed, and all the variables

TABLE 8

		Mean			*Standard deviation*		
		Experiments			*Experiments*		
		1	*2*	*3*	*1*	*2*	*3*
	IRR	9·04	9·10	9·90	3·93	5·60	8·65
ARRs	Annuity	12·47	12·56	13·30	9·85	10·02	13·20
	Straight-line	12·12	13·10	13·88	10·69	10·98	14·27
	Reducing balance	14·71	14·42	15·51	11·64	12·40	16·05

that were stochastic in nature, were assumed to be normally distributed.

Conclusion

In general the ARR did not perform satisfactorily as a surrogate for the IRR. By choosing the annuity method of depreciation, the amount of deviation between the IRR and the book yield could be reduced. However, to use a depreciation method which induces the ARR to be a more accurate reflection of the IRR, might adversely affect another accounting statistic. 'Adversely' is defined here as making that accounting statistic a poorer measurer of the principal (or concept) which it was trying to measure. (For example, in the deterministic section with a zero rate of inflation the annuity method of depreciation produced an accurate ARR at the expense of producing a declining profit figure over time.)

The results of the deterministic section indicate that the annuity method of depreciation minimised (if not eliminated) the distortion between the book yield and the IRR. Inflation and longer project lives coupled with inflation increased the distortion. The results from the probabilistic section again show that the annuity method of depreciation is better than the reducing balance (at a 30 per cent rate) and straight-line methods, though all three methods performed rather poorly.

If the basic project had had an increasing cash inflow stream or a decreasing one, or a mixture of an increasing and then decreasing (or *vice versa*) cash inflow stream, then the annuity method of depreciation may not have come out best. The superiority of the annuity method only holds for the constant cash inflow case, and even then, the probabilistic results indicate that its advantage over the straight-line method is small (but real) in an uncertain environment. Perversely, the more uncertain is the environment, the closer is the ARR to the IRR.

Appendix A

An explanation is given of why, in the deterministic model, the ARR is always equal to the IRR at a 10 per cent rate of growth despite changes in the method of depreciation. This result is a result of the mathematical properties of the paper. The explanation given here differs from that given by Solomon and Laya in their original paper:

Notation: P_t = Total profits at time t.
C_t = Total cash inflow at time t.
D_t = Total depreciation at time t.
B_t = Book value of firm at time t.
I_t = Initial cash outlays at time t.
g = Real growth rate (constant).
Y_t = Book yield $= \frac{P_t}{B_{t-1}}$

Profits are defined as cash inflows less depreciation:

$$P_t = C_t - D_t \qquad (1)$$

A change in book value, $B_t - B_{t-1}$ is defined as cash outlays (representing new assets) less depreciation:

$$B_t - B_{t-1} = I_t - D_t \qquad (2)$$

A change in book value is also equal to the last year's book value times the growth factor:

$$B_t = B_{t-1}\,(1+g) \qquad (3)$$

rearranging

$$B_t - B_{t-1} = g^{B}{}_{t-1} \qquad (4)$$

substituting (4) in (2), we get:

$$g^{B}{}_{t-1} = I_t - D_t \qquad (5)$$

Now

$$B_{t-1} = \left(\frac{I_t - D_t}{g}\right) \qquad (6)$$

$$Y_t = \frac{P_t}{B_{t-1}} = \left[\frac{C_t - D_t}{\left(\frac{I_t - D_t}{g}\right)}\right] \qquad (7)$$

When real growth rate is equal to 10 per cent ($g = \cdot 1$), Y_t will be equal to 10 per cent if, and only if, $I_t = C_t$.

Appendix B

A computer programme was designed to carry out probabilistic simulation on the hypothetical firm. Each firm would have a certain number of assets, the number being determined by the life of an asset (which is now a normally distributed variable). Supposing that the firm had six assets each with a six-year life, and one asset with an eight-year life: in the eighth year of this asset's life the firm would have seven assets, of which one would have an initial outlay. There was some modification to the normal distribution for the life of an asset in the computer programme. Although life was normally distributed with a mean of 6, it may be that picking a value at random from the appropriate normal distribution would yield a life of T years, where T was not an integer. The value of T was then rounded up or down so that it became a discrete variable.

A short description of the computer programme follows. To begin with the basic parameters of the model were fed in as data. The probability distribution for life and cash inflow were set up. The programme was then designed to look at 1,000 firms, each different in the sense that the number of assets and the value of the cash inflow might be different. (All firms would be in their respective 'equilibrium' states.)

The programme would then pick a specific point in a firm's life, say, year t. At year t, the firm would have a certain number of assets, each in a different stage of development. Supposing the oldest asset was in its eighth year of life, the programme would go back through time to year t—8, in order to collect the financial data about this asset. Similarly the programme would go forward in to time in order to collect data on all those assets that did not come to an end in year t. In this way, financial data for all years of all assets in existence at time T were collected. This meant that not only the ARR could be calculated at time t, but also the IRRs of all the assets.

The way in which the programme calculates the depreciation is important. The programme looks at the expected life of an asset *ex ante*. The expected value is six years. (Later in the programme it discovers the actual length of life.) If the final year of the asset's life is before the sixth year, the remaining net book value is written off against profits. On the other hand, if the final year is after the sixth year, then in the case of straight-line and annuity methods of depreciation, no depreciation charge is made after year six; with the reducing balance method the amount of depreciation for any one year is 30 per cent of the remaining balance of the asset's book value.

The programme looks at 1,000 of these hypothetical firms. Each time the programme collects data about a hypothetical firm it proceeds to delve into the firm's past and future until it has sufficient data to record the cash flows of the whole life of all its assets.

Having done this the ARR for the firm at that point in time is then stored together with the cash flows of all the assets of this firm. The programme can be re-run for different depreciation methods and different stages of 'controlled' uncertainty. The ARR (1,000 in all) generated from deriving data from 1,000 firms can be compared with the IRRs of the assets that comprise a firm. This presented the problem for each of the firms would have on average six assets; to have taken the IRR for all 1,000 firms would mean analysing about 6,000 assets. It seemed more sensible to take some form of average IRR for the firm (rather than six individual IRRs), since the ARR relates the total profit for all assets at a point in time to the total book value. The single IRR that the programme calculated for a firm was computed in the following manner: to begin with add all the initial outlays of all the assets, then add all the cash inflows for the first year and so forth. This meant that if the firm had six assets (each in a different stage of development) the programme imagined that all six assets were at the same state of development and thus could be summed as one project, starting with an initial outlay of £6,000 (6 × £1,000).

Each of the three experiments was run four times, each run representing the accumulation of different data. The first run collected the IRRs of 1,000 hypothetical firms (aggregating the cash flows). The second, third and fourth runs collected the ARRs of the thousand hypothetical firms using the annuity, straight-line and reducing balance methods of depreciation respectively. Each run used the same set of random numbers in order that the data generated as output to the run could be regarded as the same 'actual' events although different depreciation methods would yield different results, though of course the IRR of a firm on each run would be identical regardless of the depreciation method.

Since the calculation of negative IRRs is time-consuming, all the IRRs that had a value of less than 0·1 per cent were arbitrarily given the value of zero. This was done in order to make comparisons between the IRRs and ARRs more meaningful. For each run, the mean, standard deviation, highest and lowest value (which with one exception was zero for all the runs) was computed.

Inclusion of Budgets in Financial Reports: Investor Needs v. Management Disclosure

Pieter Elgers and John J. Clark

Recent years have witnessed a quickening interest by investors and regulatory agencies of the United Kingdom and the United States in proposals to incorporate 'audited' forecasts (budgets) with published financial statements. The contemplated reform – generally relating to short-term forecasts in annual reports and prospectuses – poses several complementary questions: Are budgets in fact consequential additions to the equity report package, and if so what should budgetary disclosure entail? Is some standard of accuracy prerequisite to the inclusion of forecast data in financial reports? What level of forecast accuracy is attainable and how does this relate to investor needs? Does the incorporation of budgetary data in financial reports imply a substantive revision in their format and content?

State of the art

The authors conducted eight case studies covering the quality and methodology of short-term sales forecasting among retail department stores, United States airlines, manufacturing (machinery, furniture, pharmaceuticals, food processing) and public utilities. These called for written submissions by co-operating companies and periodic interviews with key personnel. Each company provided data on actual and forecasted sales, annually and by quarter, for a five-year interval; net income before and after taxes and per share; related cash flows; forecasting techniques and procedures; the desired degree of accuracy and the costs of error in the sales projections.[1] Analysis underscored the following salient conclusions: (1) in all cases, good performance was defined by some specified deviation of actual from forecasted sales. Results ranged from a low of 1 per cent. of quarterly sales in the department store cases to 10 per cent. of annual sales in furniture manufacture. The average error was 3·4 per cent. (2) Except for retailing and utilities, the quality of the forecast deteriorated with time. To wit, in the airline study, the error factor in the third and fourth quarter estimates averaged twice that of the first-second quarter estimates. (3) Each data set demonstrated the sensitivity of net-income (before extraordinary items) to small changes in gross revenues. In the airline study, a 5·4 per cent. under-estimate in passenger revenue miles converted to a profit estimation error of 33 per cent.; in the retailing chain, a 5 per cent. sales error pyramided into a 16 per cent. variation in planned net-income; in food processing, the respective changes were 3 and 10 per cent. (4) None of the firms surveyed employed a purely quantitative model and in retailing the primary inputs to the forecast were the subjective estimates of sales and management personnel. (5) Deviations of actual from predicted performance and the impact of time on accuracy differed importantly from company to company and industry to industry. These conclusions were largely substantiated by surveys published in *Sales Management* and *The Accounting Review*.[2]

Although management initiates operational planning with the sales forecast, investors are rarely privy to the information. Backer surveyed 70 large companies and reported:

> 33 per cent. disclosed profit expectations via press releases or in conferences with security analysts but not directly to stockholders;
>
> 40 per cent. were willing to advise security analysts if their forecasts were within 5 or 10 per cent. of the company's estimate;

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[1] Several of these cases have been published. See John J. Clark and Pieter Elgers, 'Accuracy in Sales Forecasting', *Revista, Internazionali de Scienza, Ecoinomiche e Commerciali*, October, 1967; and John J. Clark, *The Management of Forecasting* (New York, St. John's University Press, 1969).

[2] *Sales Management*, The Marketing Magazine, Special Report, December 1967; and R. Austin Daily, 'The Feasibility of Reporting Forecasted Information', *The Accounting Review*, October 1971, pp. 686–692.

27 per cent. refused to publicize or comment upon profit expectations.[3]

What investors need to know

The Financial Executives Institute in America, composed of industry financial officers, perceives the annual report to service the needs of three principal audiences: investor-stockholders, investor-potential stockholders, and investor-advisers.[4] Granted the postulate, the content of financial statements should embody the type of data specified by representative models of investor rationality. *Current rhetoric of investment analysis stresses concern with expected returns and appropriate risk diversification.* Notably, portfolio managers dwell in an uncertain world and seek to accommodate risk in devising investment strategies. From this vantage, forecasts of sales and net-income should assist investors by foreknowledge of future cash flows and the elements of planning and chance which condition their composition.[5] Past results, therefore, are useful mainly to guide formulation of realistic expectations.

Cooper, *et al*, recommend the publication of a projected set of financial statements with follow-up comparisons to actual results.[6] Ijiri also advocates the presentation of financial statements in a format which facilitates comparison of actual and forecasted data.[7] *If the issue of including forecasted data in financial reports is interpreted in terms of ex post comparisons, then the crucial point is the reliability not the relevancy of the information.*

Demski, on the other hand, pushes beyond the notion of a comparison of estimated and actual performance and proposes the preparation of an 'after-the-fact' budget to portray optimal performance from the data available at the *end* of the period under review. The 'before' and 'after' budgets might then measure the efficiency of the forecasting procedure, while the 'after' budget could be set against actual operating performance to gauge the quality of operational control. Although his conceptions were formulated in the context of a linear programming model, Demski emphasizes his strategy applies to any decision process utilizing a structured decision model.[8] For our purposes, Demski's work sheds light on the basic distinction between forecasts and budgets, and the attendant consequences for explaining the disparities of actual and budgeted performance.

The sales forecast makes a *prediction,* while the budget describes a tentative plan of operation. Major variables controlling total sales and elasticity of demand lie beyond direct intervention of the enterprise and represent constraints on forecasting sales. The distinction, often ignored in common parlance, is more than semantic *since examination of the failure to achieve budget objectives must separate our poor predictive ability from poor operating control.* A precise sales forecast will not avail against inept management, but alert management may avert the worst effects of subpar sales forecasting. In any event, Daily's assertion that 'inaccurate forecasts . . . may be a reflection on the quality of a firm's management' implies a failure to distinguish the causes of departure from initial budget estimates.[9]

As a predictor of the state of nature *ex ante,* sales represents a random variable; and a particular forecast, an estimate of the parameters governing the random distribution. *Sales Management,* in this respect, detects a transition in management's attitude:

> . . . whereas, before, management was concerned with the single-point . . . forecast, it is now more interested in the results of uncertainty . . . So, forecasting models are now used to test the economic impact of different assumptions. Management is now concerned with the effects of a range of forecasts . . . This makes for more variable budgets and more flexible product planning.[10]

If *Sales Management* has actually identified a trend, it presages a signal movement toward meeting investor requirements; namely, *a probability distribution of sales levels with related profit forecasts and an explicit statement of the assumptions underlying management's projections.* This implies either of two formats for budgetary presentations:

(i) The publication of an array of possible budgets, together with associated probabilities of occurrence. In certain situations, the publication of high, low, and most probable budgets would fulfil the stipulation.

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[3] Morton Backer, 'Reporting Profit Expectations', *Management Accounting,* February 1972, pp. 33–37. See also R. J. Chambers, 'Measurement and Objectivity in Accounting', *The Accounting Review,* April 1964, pp. 264–274. He notes: 'Apart from resort to vague notions such as stewardship, I have seen no argument demonstrating the annual report's usefulness'.

[4] *Bulletin,* March 1972.

[5] W. W. Cooper, N. Dopuch, and T. F. Keller, 'Budgetary Disclosures and Other Suggestions for Improving Accounting Reports', *The Accounting Review,* October 1968, pp. 640–648.

[6] *Ibid.*

[7] Yuji Ijiri, 'On Budgeting Principles and Budget-Auditing Standards', *The Accounting Review,* October 1968, pp. 662–667.

[8] Joel S. Demski, 'An Accounting System Structured on a Linear Programming Model', and 'Some Observations on Demski's Ex Post Accounting System: A Reply', *The Accounting Review,* October 1967 and October 1968, pp. 701–712 and p. 672.

[9] Daily, *op. cit.*

[10] *Op. cit.*

(ii) The publication of the parameters of the sales forecast distribution along with a financial model of the firm to enable the investor to translate potential errors in sales predictions into potential errors in net-income or earnings per share.

The first format seems to us unworkable. The second seems compelling *vis-à-vis* the fundamental purpose of financial statements. Yet the implications for traditional financial reports are thorough-going.

Measuring forecast accuracy

Accuracy criteria emanate from the decision model which the forecast is intended to serve. The managements included in the case studies determined accuracy in one of the following ways:

(i) *Comparison with actual total sales*

All interviewees evaluated the sales forecast by matching it against the record and stating the divergence in absolute or percentage terms. The validity of this test depends upon the characteristics of the data. If the series has only limited room to move, the test will make the projection appear better than justified; for erratic data, the comparison may fairly point up the quality of the forecast effort. As a corollary, if the economic climate is one of steady, secular growth, industry and company performance may be inherently easier to predict than in periods of economic disruption. Thus it is misguided to assess the quality of sales forecasting without reference to macro-economic variables.

(ii) *Comparison with actual change in total sales*

To complement the above, some companies contrasted the *anticipated change* in sales and the *actual change* with the disparity noted in absolute or percentage terms. Errors which appear insignificant from the perspective of total sales comparisons may assume far greater significance when expressed in terms of expected versus actual change. The latter has especial pertinence to investors, since various valuation models for securities embody an expected rate of earnings growth.

Company forecasters applied standard variance analysis (see Appendix 1) to evaluate the accuracy of sales estimates. But such comparison should be undertaken with exceeding care. Periodic shifts of management personnel render suspect the validity of historical analogies, and

> In using forecasts from different methods or prepared by different forecasters, it is a necessary prerequisite of a meaningful comparison that the forecasts were all made under the same conditions. In practice, this criterion is often unattainable for a number of reasons . . . the forecasts might have been prepared with different lead times, and thus the amount of information available at the time of the forecasts would have differed . . . one forecast might have been made using one assumption with regard to fiscal and monetary policy, and another forecast might have incorporated an entirely different assumption . . . the forecasts may have been generated from models using different statistical estimation procedures. In this circumstance, it is difficult to distinguish the extent to which the forecasting errors resulted from models rather than estimating procedures . . . one forecast might have undergone several *ad hoc* revisions, while the other might have reflected only the forecaster's initial thoughts.[11]

To some extent, the forecast accuracy achieved mirrors the cost of predictive errors. If the firm has the ability to adapt quickly to altered market conditions, it requires a less precise and inexpensive forecasting effort. Otherwise, management will increase spending on the forecast function until a desired accuracy is reached. Moreover, forecasts constructed for internal operations may consciously distort accuracy to elicit particular feedback effects or to reflect asymmetrical costs of over- versus under-estimation. Elmer Bratt has observed:

> Depending on the use to which a sales forecast is to be put different kinds of information will be found most useful . . . If a company finds that either over-estimation or under-estimation would be far more costly than the other in making company plans, a different kind of forecast may be needed . . . Forecasting the probable level might be a completely separate process and one in which the company has no particular interest.[12]

Comparative performance offers management a valuable tool for operational control and evaluation. *It has import for the investor only to the extent of foreshadowing future probable variations in the company's sales estimates and if the investor possesses the wherewithal to convert a probable error in the sales forecast into statistics of merit for investment decisions.*

Profit forecasts

Cyclical fluctuations over the past two decades have demonstrated the sensitivity of net-income (before extraordinary items) to small changes in operating revenues. The phenomenon arises from cost rigidities in research and development expenditures (or amortization thereof), depreciation, costs of debt financing, and the substitution of quality for price competition; in a word, operating and financial leverage.

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[11] Robert B. Platt, 'Some Measures of Forecast Accuracy', *Business Economics*, May 1971, pp. 30–39.

[12] Elmer C. Bratt, *Business Forecasting* (New York, McGraw-Hill Book Company Inc.), pp. 318–319.

Case data exhibited relationships well understood by accountants: the 'all variable cost' company will have identical percentage errors in sales and profit predictions; the 'all fixed cost' company will have identical absolute dollar amounts of error in sales and profits, but the percentage errors in both series will depend upon the distance of the initial projection from the 'breakeven' point. Since most real world firms have cost structures between these extremes, we may in general note that the preponderance of fixed costs in total costs determines in great measure the profit impact of a given error in sales prediction.

Daily concluded as a prerequisite to the inclusion of budget data that 'it will be necessary to establish a criterion for accuracy which it will be possible for all firms to meet' and that a 'criterion of 10 per cent. to 15 per cent.' of net-income appears to be a reasonable goal.[13] Tables I and II display the implications of the 10 per cent. guideline for companies of various hypothetical cost structures.

To keep the concept of cost structure unambiguous, assume either direct costing or neutral changes in inventory balances.

Observations on the tables

(i) A given standard of accuracy in sales prediction – say 5 per cent. – has vastly different implications for profit prediction in the presence of dominating fixed costs influences.

(ii) A standard for profit prediction – say 10 per cent. as in the illustrations – implies a stringency in predicting sales directly related to cost structure leverage.

(iii) Varying the configuration of fixed and variable costs emphasizes the point. With an initial sales projection of $100, a contribution margin of 60, and fixed costs of $59, a 5 per cent. sales under-estimate would trigger a profit prediction error of 300 per cent. Conversely, in the same situation, a net-income accuracy requirement of 10 per cent. would lead to a ·001 2/3 per cent. restriction on sales error. Clearly, *to stipulate a 10 or 15 per cent. accuracy criterion for profit prediction would elevate sales forecasting to the status of an exact science.*

The tables, albeit deliberately simplified, highlight elementary relationships overlooked in recent attempts to examine forecasting accuracy.[14] The basic formulation assumes direct costing format (or neutral inventory change) as well as constant (and determined) unit variable costs, sales prices and fixed costs. A more realistic construction would admit of multi-product plants, differences in levels of production and sales and uncertainties attending each of the basic input estimates (including covariance between each of the random variables).[15] If

TABLE I

Net-income errors implied by five per cent. sales forecast errors for various cost structures

Initial sales prediction	*Contribution Margin %*	*Fixed costs*	*Profit prediction*	*Profit, 5% sales under-estimate*	*Profit error %*
$100	60	$50	$10	$13	+30
100	60	40	20	23	+15
100	60	30	30	33	+10
100	60	20	40	43	+ 7·5

TABLE II

Maximum allowable sales forecast errors implied by ten per cent. net-income error for various cost structures

Profit prediction	*Contribution margin %*	*Fixed costs*	*Sales prediction*	*Sales, 10% profit under-estimate*	*Sales error %*
$10	60	$50	$100	$101⅔	+1⅔
20	60	40	100	103⅓	+3⅓
30	60	30	100	105	+5
40	60	20	100	106⅔	+6⅔

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[13] *Op. cit.*

[14] *Ibid.*

[15] It is worthwhile to recall that budgets are in fact derived from forecasted estimates of material prices, wage rates, discretionary fixed costs, etc., in addition to projected sales revenues. The subject, however, lies beyond the scope of the present discussion. See R. K. Jaedicke and A. A. Robichek, 'Cost-Volume-Profit Analysis Under Conditions of Uncertainty', *The Accounting Review*, October 1964, pp. 917–926.

financial statements disclosed such functional dependencies and disaggregated sales into price and quantity components, the investor could test alternative forecast assumptions and estimate net-earnings over a range of sales predictions. Such comprehensive disclosure would also minimize the potential for management manipulation of forecast information, although in particular circumstances competitive disadvantages may arise.

The accuracy approach to including forecasted data in equity reports misreads the issue. It is not possible or essential to promulgate across-the-board criteria.[16] Desirable accuracy correlates to industry and firm characteristics; that is, to some particular structural model joining sales to net-income. Therefore, the task is to design a format for the presentation of budget data so that the investor might weigh the prospects of the firm against the opinions of management. No one can assure the investor that a given forecast method will place sales or net-income within a legislated percentage fluctuation. Financial reports can only disseminate pertinent information to permit the investor to assess the alternatives.

Content of forecasted statements

This section offers some initial recommendations on content of budgeted income statements which include probabilistic information. The probabilistic variables are normally distributed, so that the implications of external budgetary disclosure for the multi-product firm are stressed. Further assume disparate rates of contribution for the various segments as described in Table II (1). The statement presumes direct costing, although the profit budgets might be easily revised to reflect absorption costing by explicitly incorporating management's intention to build or liquidate fixed cost in inventories.

Table II (2) introduces certain variance-covariance assumptions pertaining to the budgets of Table II (1). Differences in the standard deviations of total sales and operating profits result from differing assumptions regarding covariability among product lines.

Note:

> Perfect positive correlation and identical coefficients of variation among all products (Table II (2*a*)) is identical to the assumption of constant mix. In this case, the separate product data provides a profit variability measure identical to that apparent in Table II (1).
>
> The assumptions of completely independent sales distribution (Table II (2*b*)) or moderately correlated distribution (Table II (2*c*)) produce marked effect on the profit distribution. In these cases, even though we have assumed strict linearity of cost behaviour (which is implicit in direct costing format), the correlation of profit movements to sales movements is weakened. Thus the aggregated date of Table II (1) would here be insufficient to enable the analyst to translate sales errors to profit errors.

The covariability relations among different segments or product lines requires that the analyst be furnished information regarding such 'horizontal covariance'; in addition, the profit distribution depends upon 'vertical covariance', or the covaria-

TABLE II (1)

Budgeted income statement: total and by product line

(*All figures are in millions of dollars*)

			Product A			Product B			Product C		
	Total	*Unallocated**	$\bar{X}_A$	σ_A	$\sigma_A/\bar{X}_A$	$\bar{X}_B$	σ_B	$\sigma_B/\bar{X}_B$	$\bar{X}_C$	σ_C	$C\sigma/\bar{X}_C$
Sales	$600		$200	20	·10	$200	20	·10	$200	20	·10
Variable cost	(240)		40	4	·10	80	8	·10	120	12	·10
	360		160	16	·10	120	12	·10	80	8	·10
Contribution margin %	(60%)				(80%)			(60%)			(40%)
Fixed costs:											
Discretionary	(100)	(10)	(40)	—	—	(10)	—	—	(40)	—	—
Non-discretionary	(200)	(60)	(55)	—	—	(45)	—	—	(40)	—	—
Operating profit (loss)	$60	(70)	$65	16		$65	12		–0–	8	undefined

* Joint fixed costs, not allocated to the separate product lines.

$\bar{X}$ = Expected sales.

σ = Standard deviation.

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[16] The authors do not concur in the position of the Financial Executives Institute that business does not have the ability to forecast with the degree of accuracy essential to public disclosure (See *Bulletin*, March 1972) nor with the implication of the UK rule that in take-over bids an industry panel investigate forecasts with an error in excess of 10 per cent.

TABLE II (2)

Budgeted income statement totals:
Probabilistic data based on differing covariance assumptions

Part (a): Perfect positive correlation among all products

				95% Confidence interval ($\approx \pm 2\sigma$)	
	Total ($\bar{X}$)	σX*	$\sigma/\bar{X}$	*Lower bound*	*Upper bound*
Sales	$600	60	·10	480	720
Variable costs	[240]	[24]	·10		
Contribution	360	36	·10		
Fixed costs:					
Discretionary	[100]	—	—		
Non-discretionary	[200]	—	—		
Operating profit (loss)	$60	36	·60	[12]	132

* In general, $\sigma = \sqrt{\Sigma_j \, \Sigma_i \, \mathrm{COV}\,(X_i, X_j)}$

In the special case of perfect correlation among all products, this reduces to:

$$\sigma = \sum_i \sqrt{\mathrm{VAR}\,(X_i)}$$

Thus, for sales, $\sigma = \sigma_A + \sigma_B + \sigma_C$
$= 20 + 20 + 20 = 60$

And, for profits, $\sigma = 16 + 12 + 8 = 36$

Part (b): Independence (no correlation) among all products

				95% confidence interval	
	Total ($\bar{X}$)	σX	$\sigma/\bar{X}$	*Lower bound*	*Upper bound*
Sales	$600	34·64	·058	531	669
Variable costs	[240]	13·86	·058		
Contribution	360	20·78	·058		
Fixed costs:					
Discretionary	[100]	—	—		
Non-discretionary	[200]	—	—		
Operating profit (loss)	$60	21·54	·395	17	103

With all distributions independent, the expression for the standard deviation reduces to:

$\sigma = \sqrt{\Sigma \, \mathrm{VAR}\,(X_i)}$

Sales: $\sigma = \sqrt{(20)^2 + (20)^2 + (20)^2} = \sqrt{1200} = 34{\cdot}641$

Profit: $\sigma = \sqrt{(16)^2 + (12)^2 + (8)^2} = \sqrt{464} = 21{\cdot}54$

Part (c): Moderate correlation among product forecasts

				95% Confidence interval	
	Total ($\bar{X}$)	σX	$\sigma/\bar{X}$	*Lower bound*	*Upper bound*
Sales	$600	52	·087	496	704
Variable costs	[240]	20·8	·087		
Contribution	360	31·2	·087		
Fixed costs:					
Discretionary	[100]	—	—		
Non-discretionary	[200]	—	—		
Operating profit (loss)	$60	32·25	·538	[4·0]	124

Assume the following correlation coefficients:

a, b=·8
a, c=·6
b, c=·5

The expression simplifies to:

$\sigma = \sqrt{\mathrm{VAR}\,(X_i) + \Sigma \, 2\mathrm{COV}\,(X_i, X_j), i \neq j}$

Sales: $\sigma = \sqrt{1200 + (2)\,(\cdot 8)\,(20^2) + (2)\,(\cdot 6)\,(20^2) + (2)\,(\cdot 5)\,(20^2)} = \sqrt{2720} = 52$

Profit: $\sigma = \sqrt{464 + (2)\,(\cdot 8)\,(16)\,(12) + (2)\,(\cdot 6)\,(16)\,(8) + (2)\,(\cdot 5)\,(12)\,(8)} = \sqrt{1020{\cdot}8} \approx 32$

TABLE III (3)

Summary of results, and comparison to predicted profits

Case 1:	*Perfect positive correlation among forecasts*			
		Sales	*Profits*	*Predicted profits**
	Mean	600	60	60
	Lower bound	480	[12]	[12]
	Upper bound	720	132	132
Case 2:	*Independent forecasts*			
		Sales	*Profits*	*Predicted profits**
	Mean	600	60	60
	Lower bound	531	17	18·6
	Upper bound	669	103	101·4
Case 3:	*Moderately correlated forecasts*			
		Sales	*Profits*	*Predicted profits**
	Mean	600	60	60
	Lower bound	496	[4·0]	[2·4]
	Upper bound	704	124	122·4

* In each case, predicted profits are given by the relationship contained in the aggregated direct cost data. Profit = ·60 (Sales) – Fixed costs.

bility of the separate revenue and expense items comprising each product line report. For present purposes, we restrict attention to the sales distribution (implicitly assuming that variable costs are perfectly correlated to sales, and all fixed costs are known with certainty). Of course, budgetary disclosure would ultimately detail the release of full covariance data, together with the assumptions which underlie the estimates.

Table III (3) summarizes the outcomes of the different assumptions. The profit-volume equation implicit in the aggregated company data (total columns in Table I (1) or II (2) is:

Profit = ·60 (Sales) – Fixed cost

The profit equation adequately translates given sales errors into operating profit effects in the first case examined (perfect positive correlation and identical co-efficients of variation); in each of the other cases, the profit estimating equation developed from the aggregate relationships would be a poor predictor of profit performance.

The utilization of variance-covariance analysis in business forecasting is well established in practice and the literature on the derivation of probability distributions, extensive. No particular conceptual problems exist to bar application to the sales, costs and net-income estimates which comprise the budget.[17] Therefore, although it would signify a major reorientation of reporting practices, the inclusion in corporate financial reports of expected sales and covariance among product lines would enable the investor-analyst to formulate his own assessments of the company's fortunes. If the investor, for example, were provided with expected total sales (segregated by product lines), the covariance among product lines, and the structure of company costs, he might experiment with different product sales mixes which conform to his assumptions about the economy and determine their implications for net-income. In this event, the historical accuracy of company forecasting constitutes a marginal consideration since the investor has the appropriate data to act upon his own insights and assumptions. Historical accuracy – the variance of actual and forecasted sales in prior years – is significant to the analyst only as benchmark data against which to argue his particular assumptions regarding the future behaviour of sales.

Summary and recommendations

(i) The debate over the publication of forecasted budgets should turn on the relevancy of the information to the user, not merely on the accuracy of data which may have minimal utility for the investor. Outside the pristine case of perfect prediction, accuracy is an ambiguous prescription except by reference to specific decision models. Nor is it clear whether the total, direction, rate of growth or some other parameter of the sales forecast or the budget has most pertinence for the investor-analyst. Likewise, if we admit that investment strategies are multidimensional, comprehending not only sales and profit expectations but other aspects of stability, liquidity and so on, then the endeavour to establish accuracy criteria ought logically to encompass error magnitudes for each of these elements too. Add to the diversity of investor interests the myriad of technological and financial structures among industries and firms, and the futility of fixed standards becomes readily apparent.

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[17] For further reading, see William L. Ferrara and Jack C. Hayya, 'Toward Probabilistic Profit Budgets', *Management Accounting*, October 1970, pp. 23–28, and Albert L. Arcus and William H. Pietsch, 'Planned Performance and the Product Cost Controversy', *Management Accounting*, September 1970, pp. 9–14.

(ii) Comparisons of last period results against budget estimates are *per se* inadequate unless (*a*) the separate effects of poor prediction and poor control are detailed, and (*b*) the assumptions guiding the construction of the coming year's budget are available. Stated differently, a simple chronological summary of attained accuracy statistics is unlikely to aid in determining the precision of current forecasts since the attribute of consistency is lacking when comparisons cover several periods.

(iii) Chartered accountants, company financial officers, investor groups, and government personnel should join to improve the format and content of company financial disclosures. In effect, design a set of statements allowing the investor to impose his own judgments regarding macro-economic, industry, and other relevant variables. If management's own assumptions in preparing sales forecasts and derivative budgets were similarly enumerated, investors might accordingly weigh their realism. The concept merits an extensive research effort – including the significance of product line covariance analysis in financial reporting and the competitive implications of such disclosures – in the direction of an information system to accommodate an evolving emphasis in public financial data from the verification of past events to the prediction of future outcomes.

Appendix 1

Analysis of forecast error

Variance analysis offers a ready means to measure the size and ascertain the source of the sales projection error:

Assume:

Year		*Predicted sales* (*P*)		*Actual sales* (*A*)
1965		$3		$2
1966		5		3
1967		6		7
1968		10		8
	$\bar{P}$	$6	$\bar{A}$	$5
Standard deviation				
	S_p	$2·54	S_a	$2·54

1. *Mean square error* (L^2)

$$L^2=\frac{1}{T}\sum_{t=1}^{T}(P-A)^2$$

$$=\frac{\$10}{4}$$

$$=\$2·5 \qquad (1)$$

The mean square error (L^2) or the standard error of the estimate ($\sqrt{L^2}$) describes the average deviation between actual and forecasted sales over T periods of time.

L^2 can be decomposed into three elements each of which refers to a particular kind of prediction error:

1a. $(\bar{P}-\bar{A})^2$ or the squared difference in the means of forecasted and actual sales, shows the average tendency of the forecasts to be either under or over estimates, i.e. a bias in either direction. The element would be zero if on the *average* the actual and predicted sales were equal.

Thus $(\bar{P}-\bar{A})^2=(6-5)^2=1$.

1b. $(S_p-S_a)^2$; this component equals zero if the standard deviation of the actual and predicted sales are equal. On the average, the company's model might predict very well, but the deviations of the predictions from their mean might have fluctuated to greater or lesser degree than for the actual sales. If $S_p > S_a$, the forecast may be too sensitive to changes in the causal variables. If $S_p < S_a$, the forecast evidences a lack of responsiveness to the underlying variables.

For the assumed data, $(S_p-S_a)^2=(2·54-2·54)^2$ $=0$.

1c. $2(1-r)\, S_pS_a$; if *r* (correlation coefficient of predicted and realized changes) equals

$$r=\frac{\frac{1}{T}\sum_{t=1}^{T}(P_t-\bar{P})\,(A_t-\bar{A})}{S_pS_a},$$

then this term reflects the error originating in a lack of perfect correlation between actual and predicted sales. The error may spring from random factors in the actual observations which cannot be forecasted or from intrinsic deficiencies in the relationship between sales and the variables comprising the forecast model.

The correlation coefficient (r) further provides a relative indicator of dispersion; r=1, a perfect forecast record or standard error of zero; r=0, the forecasting model has no predictive ability; as r approaches 1, the projected and actual sales converge.

Computing r in the illustration

$$r=\frac{\frac{23}{4}}{(2·54)\,(2·54)}$$

$$=·88$$

and $2(1-r)\,S_p\,S_a$

$2(1-{\cdot}88)\,(2{\cdot}54)\,(2{\cdot}54)=1{\cdot}50.$

1*d*. Therefore, joining the terms to uncover the source of error, we have:

$$L^2=\frac{1}{T}\sum_{t=1}^{T}(P-A)^2$$

$$=(\bar{P}-\bar{A})^2+(S_p-S_a)^2+2(1-r)\,S_p\,S_a$$

$$2{\cdot}5=1+0+1{\cdot}5.$$

Dividing both sides of the basic equation by the mean square error (L^2) yields the error percentage attributable to bias, errors in variations, and errors due to imperfect correlation. In the illustration, 40 per cent. of the forecast error represents bias and 60 per cent. a failure in correlation.

2. *Comparison of forecast methods*

One common method of judging the expertise of the company's forecasters lies in comparing their performance against forecasts that would have resulted from the use of naive mechanical formulae, such as forecasts of no change, forecasts based upon the assumption of a constant average rate of change, or forecasts representing linear extrapolations of a regression line. Alternatively, the forecasters may be rated against more sophisticated methods, and the performance index in this event might suggest the expenditure of added funds on the predictive function. Whichever the case, the Theil Inequality Coefficient (U^2) provides a handy calculation of comparative performance:

$$U^2=\frac{\dfrac{\sum\limits_{t=1}^{T}(Y_{ct}-Y_t)^2}{T}\qquad\text{(A)}}{\dfrac{\sum\limits_{t=1}^{T}(Y_{ct}-Y_t)^2}{T}\qquad\text{(B)}}$$

A, the numerator, displays the mean square error of the existing system used by the company. *B*, the denominator, expresses the mean square error of some alternative approach. If $U^2>1$, the extant technique is less accurate than the contending method; if $U^2<1$, the company forecasters are performing better than the competition. If $U^2=0$, the company forecast is perfectly on target.[18]

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[18] Henri Theil, *Applied Economic Forecasting* (Chicago, Rand McNally and Company, 1966), ch. 2. Also Pratt, op. cit.

Financing an Acquisition

R. J. Lister

The level of corporate expenditure on acquiring other firms[1] emphasises the importance of the careful financial appraisal which should precede an acquisition.

Guidelines for this appraisal can be found in the literature on capital investment analysis, since the acquisition of another firm does not differ conceptually from an internal capital investment. Indeed, books and papers have appeared which discuss and illustrate capital investment appraisal with specific reference to acquisitions.[2] [3] [4] However, despite the similarity, special problems arise in the acquisition situation which are usually either absent or more simply analysed in the context of an internal capital investment.

The purpose of this article is to focus attention on one of these special problems – financing the acquisition.

The matter is an important one because the net benefit which will accrue to the owners of the acquiring company (i.e. to its ordinary shareholders) depends not only on the *size* but also on the *form* of purchase consideration which is used.

What are the relative advantages of offering to issue shares, or some other form of financial stake in the new combination, or simply cash to the owners of the subject company, in exchange for their existing shareholdings? The aim of the acquirer in this respect can be simply stated: as for an internal project, it is to finance the investment at least cost to his own shareholders. However, achieving this objective in the case of an acquisition presents particular complexities because:

(*a*) The range of financing possibilities is usually far wider than for an internal capital project;

(*b*) The subject company will already possess a financial structure which will partly determine the best form of purchase consideration to be used;

(*c*) The solution must be satisfactory to the subject company's shareholders; otherwise they will reject the acquirer's offer.

The procedure in this paper will be to present the components of the acquisition financing decision in the following order:

1. Relative costs of the basic forms of finance;
2. Temporary factors affecting the choice of purchase consideration;
3. Characteristics of the parties which may affect the choice;
4. Constraints on optimality;
5. Acquisition financing decisions in practice.

The basic forms of finance

Ordinary shares

The ordinary shareholders are entitled to what remains, if anything, after all the company's expenses, including obligations to other investors, have been met. Being thus exposed to most risk, they require a higher return on their financial stake in the company than other, more securely placed, investors. From the acquirer's viewpoint, therefore, equity shares are the most expensive form of purchase consideration which can be offered. Merrett and Sykes,[5] appraising equity shareholders' required rewards, by reference to historically achieved returns, conjectured in 1966 that 'shareholders can reasonably expect to continue to receive over the next ten years or so a return' (in the form of dividends and capital gains combined) 'of 7 per cent in real terms, net of corporation, dividend withholding and capital gains tax. With 3 per cent annual inflation this implies a 10 per cent return in money terms.'

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[1] £1069 mn was spent on acquisitions in 1969; £1122 mn in 1970, and £1822 mn in 1971. *Trade and Industry*, Vol. 7, No. 8, 25 May 1972.

[2] A. J. Merrett and A. Sykes, *Finance and Analysis of Capital Projects* (Longmans, 1963), ch. 10, 11, 12.

[3] A. Hichens, 'Valuing a Company for Acquisition', *The Investment Analyst*, May 1967.

[4] A. Buckley, 'The Acquisition as a Capital Budgeting Decision', *Management Decision*, Vol. 9, No. 3, Winter 1971.

[5] A. J. Merrett and A. Sykes, *Capital Budgeting and Company Finance* (Longmans, 1966), p. 32.

Taking the case of a company retaining 50 per cent of its earnings, they calculate that the company must earn profits after corporate tax of 14 per cent on its investments to provide shareholders with the required net-of-personal tax return.

Pizzala[6] has argued against Merrett and Sykes that the rates of return achieved for shareholders in the past are no guide to the future. He argues this on the grounds *inter alia* that over the last 15 years or so 'the rate of return obtained by shareholders (including capital appreciation) was greater than the actual earning capacity of the private sector.' He concludes: 'If gross earnings do not show a significant improvement, the long run real return to shareholders might not be much better than half the amount they earned over the last 15 to 20 years, unless proposed tax changes prove to be very advantageous to shareholders.'

The above controversy illustrates the difficulty of *quantifying* the cost of different forms of finance. *Ranking* these costs is fortunately more straightforward.

Loan capital

As an alternative to inviting the subject company's shareholders to take up shares in the new combination in exchange for their existing holdings, the acquirer might offer to issue some form of loan capital to them.

Being a lender to, rather than an owner of, the company, the holder of loan capital is contractually entitled to a stipulated return, whether or not profits are earned. This return is usually in the form of a fixed annual rate of interest and repayment of principal at or between specified dates. If the company defaults, the holders of loan capital, like any other creditor, can take legal action to enforce payment out of the company's assets of the amount due to them.

Loan capital is a cheaper form of finance than ordinary shares for the following reasons:

(*a*) Being exposed to less risk than the ordinary shareholder the lender is prepared to accept a lower rate of return on his stake in the company.

(*b*) The company's obligations to lenders are usually fixed in money terms, the rate of interest and repayment of principal being stipulated in *money* terms when the contract with the lenders is made.

If the purchasing power of money declines during the period of the contract, it follows that the interest and repayment commitment declines in *real* terms.

Intuitively one would expect lenders to react to this prospect by stipulating at the outset a monetary rate of return sufficient to compensate them for prospective inflation.

Against this it is argued, for example[7], that in practice increases in lender-demands in reaction to prospective inflation occur too late and in too small measure to offset this advantage to the borrower; further, that 'the fixed interest loan market is seriously influenced by institutional factors and the measures taken by the monetary authorities to limit the cost of long-term government borrowing . . . ' (and that) ' . . . as a result of these factors and, indeed, ignorance on the part of private lenders, interest rates are probably only partly adjusted to offset inflation . . . '

The above was written in 1963. Since that time increasing lender-sophistication, increasing fears of inflation in the light of the experience of recent years,[8] and changing official policy have tended to reduce the force of these arguments.

(*c*) An undisputed reason for the cheapness of loan capital is that interest paid on loans is 'tax-deductible.' Since loan interest, in contrast to dividends paid to shareholders, is an allowable expense in arriving at a company's taxable profit, the cost to the paying company is the rate of interest *less* the associated tax relief. For example, given corporate tax at 40 per cent the annual cost of servicing an 8 per cent debenture would be:

$$8\% \times \frac{100-40}{100} = 4{\cdot}8\%$$

Recognition of the above advantages of loan capital must be accompanied by awareness of its implicit costs.

(*a*) Management has to contend with an increasing marginal cost of loan capital. The greater the proportion of loan capital in a financial structure

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[6] F. B. Pizzala, 'The Cost of Capital to the Private Sector: a Critique of Merrett and Sykes' *Moorgate and Wall Street*, Spring 1972.

[7] A. J. Merrett and A. Sykes, *Finance and Analysis of Capital Projects* (Longmans, 1963), p. 215.

[8] cf. J. Sparrow, 'Convertible Loan Stocks', *Journal of Business Finance*, Vol. 1, No. 1, Spring 1969, p. 25: '. . . the institutions and others who supply the money for company finance are becoming increasingly aware of the way in which inflation attacks the position of a lender. It is for this reason, among others, that the rates of interest for long-term straight debt have risen to the all-time high . . .'.

(i.e. the greater the extent of the 'gearing'), the less secure is the position of a lender. As more lenders join him, competing for a share of the operating cash flows, there is an increasing risk that the company will generate insufficient cash flows to meet all claims at the due time. Each successive lender will view his position as riskier and will demand an accordingly higher rate of interest as compensation.

(*b*) Like the lender, the ordinary shareholder also has cause for greater anxiety as gearing is increased. Each additional unit of loan capital represents an additional contractual claim which must be met before any return accrues to him. His position becomes riskier, and he can be expected to demand a higher return as compensation for this. The question for acquiring management is whether the explicit cheapness of loan capital will be offset by an enhanced cost of equity capital.

It is generally agreed that gearing, in currently prevailing fiscal and capital market conditions, if exploited within reasonable limits, will be regarded neither by ordinary shareholders nor by lenders as exposing them to undue risk; to this extent, then, a company may exploit for its shareholders' benefit the explicit cheapness of loan capital, without this being offset by its implicit costs. The criteria for determining a 'reasonable' level of gearing are considered later.

Between equity and loan capital lie the securities which have some of the characteristics of each.

Convertible loan stocks begin their lives as a form of loan capital with the associated advantages and problems. The holders have the right to convert into ordinary shares, on terms specified at the time of issue of the loan stock. If the rate of interest on a convertible loan stock is below the market rates for similar non-convertible loan stock, more generous conversion terms will need to be offered to compensate holders for the interest forgone. In corporate financing terms a lower initial loan-financing burden will be accompanied by a heavier equity burden later on. This is undesirable from the corporate viewpoint when one remembers that loan interest attracts tax relief whereas payments to equity shareholders do not.

Convertibles are favoured as a form of purchase consideration in acquisitions for a number of reasons, well summarised by Sparrow[9]: 'The attractions of convertible loan stocks to all parties stand out. For the shareholder whose shares are being bid for there is a guaranteed income at an attractively high rate; there is an option to convert into equity as a hedge against inflation; there is deferment of capital gains tax liability; and there is the long-stop of a fixed date for repayment at par if things go wrong. For the company making the bid there is a lower interest cost than would be the case with a straightforward loan stock; there is tax relief on the servicing costs; there is a breathing space before conversion in which to achieve and consolidate the benefits of the merger; conversion, when it does take place, will be at a price above that at which the shares could be issued today, further reducing the risk of dilution . . .'

The reader will recognise that when the convertible loan stockholders have exercised their conversion rights the 'gearing' disappears from the financial structure and is replaced by equity.

This disadvantage can be avoided by offering to the subject company's shareholders a loan stock with separately exercisable equity subscription rights. Here the holder has a right to take up shares, not in exchange for but in addition to, his loan stock by subscribing additional cash in accordance with the terms of the stock. From the corporate viewpoint the cheaply serviced loan capital is thereby retained and, in addition, insofar as subscription rights are exercised, cash is raised without the formality and expense of a fresh fund-raising operation. Jim Slater refers to the advantages of this type of instrument.[10] Such an issue may be made more attractive to the vendor-shareholders by issuing the subscription rights in the form of detachable warrants which can be bought and sold separately from the loan stock.

To summarise the presentation to this stage: loan capital is the cheapest means of financing an acquisition provided, as a result, reasonable levels of gearing are not exceeded. Convertible loan stock and loan stock with equity subscription rights include some of the advantages of loan capital but ultimately entail some equity burden. Ordinary shares are the most expensive form of finance which can be used.

Cash consideration

As an alternative to offering share or loan capital (i.e. 'securities') to the subject company's shareholders, the bidder may offer to acquire their shares wholly or partly for cash.

Existing cash may be used, in which case the acquirer is involved in no new financing. Alternatively, cash may be raised by issuing share or loan capital to the public – in which case the matters already discussed concerning the relative costs of the various forms of financial instrument will arise.

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[9] J. Sparrow, 'Convertible Loan Stocks', *Journal of Business Finance*, Vol. 1, No. 1, Spring 1969, p. 26.

[10] J. Slater, 'Raising Capital for Horizontal Integration', *Stock Exchange Journal*, Vol. 13, No. 4, December 1968.

The choice between using *existing* and *newly-raised* cash raises questions which cannot be pursued within the limits of this paper, such as: What is the opportunity cost of existing cash? What are the relative merits of alternative uses? Would these opportunities have to be entirely forgone if existing cash were used for the acquisition? Does the value of the acquisition depend to any extent on the alternative uses? How will the use of existing cash affect the capacity of the joint entity to raise cheap loan capital? Will the use of existing cash unduly deplete group liquidity? Such questions are set aside, attention here being focussed on the relative merits of using *cash*, as against *securities*, as the form of purchase consideration.

Cash offers a means of acquiring a company without giving its shareholders any share in or control over the future of the combination. In the absence of capital gains tax problems, referred to later, cash may have the further merit of being the most acceptable form of consideration from the viewpoint of the subject company's shareholders; for example:

(*a*) They may not wish for a stake in the acquiring company's business – for reasons of personal distaste or because it may be of an unacceptable risk category. A cash offer enables them to sell out without any subsequent commitment to the new combination.

(*b*) A corporate shareholder of the subject company, having a large and otherwise unmarketable block of shares, may welcome cash as a means of liquidating his investment for use in his own internal projects.

(*c*) Particularly for the less sophisticated shareholder of the subject company, cash has the advantage of being a simple and certain form of payment. However, it may not be a practical proposition to raise cash if the acquisition represents a relatively large outlay by the acquirer. As Grant points out: 'If the two companies are much of a size, inevitably the greater part of the consideration must be in the form of paper because the cash cost of the purchase will be clearly beyond the capital-raising ability of the acquiring company.'[11]

A means of using cash without depleting the acquirer's resources and without explicitly raising cash is to offer securities to the vendor-shareholders and to arrange for underwriters to make a simultaneous cash offer for the securities. This will of course commit the acquirer to the expense of the underwriting arrangements.

Temporary factors

The purpose of this section is to indicate that, even though a company may be able to use one of the cheaper forms of finance as purchase consideration in an acquisition, it may be beneficial, due to the impact of temporary factors, to use an intrinsically more expensive form.

For example, the acquirer's shares may be undervalued at the time of the acquisition, i.e. the stock exchange price of his shares understates the value which will be placed on them when their prospects are recognised by the market. If the purchase price for an acquisition were settled in undervalued shares, existing shareholders would clearly suffer detriment, to the extent that the outside recipients of the new shares would receive a stake in the acquiring company for less than its value.

One possibility in such a case is to settle the purchase consideration using existing cash, thereby avoiding the need to issue shares at prevailing disadvantageous terms. If an offer of existing cash is not practicable there may be a case for temporarily overgearing the company by an issue of loan capital, restoring the balance by subsequent retention of equity earnings or by an issue of shares at a more propitious time. This may entail a penalty in terms of the rate of loan interest which would have to be paid. However, the incremental cost of this, especially in view of the effect of inflation in the long term, may be a lesser burden than that of the additional equity which would otherwise have to be issued as a result of the undervaluation.

Rigid adherence to the theoretical relative cheapness of the various forms of finance may further be ill-advised in view of recent financing undertaken by the acquirer or fund-raising proposed in the near future. For example, if a large issue of loan finance has recently been made, the market may be unwilling to digest, other than on expensive terms, a further issue at the time of the acquisition. If management is proposing a new issue of equity shortly after the take-over, any short-term dilution of earnings or dividend, which might produce an unfavourable reaction from the stock market, would have to be avoided. This possibility may prompt a company to refrain from financing an acquisition using loan capital in view of the short-term effect on earnings of the initially costly interest payments. As Grant says: 'No company should undertake any financing operation, whether to meet the cost of purchasing another company or simply to replenish resources during a period of heavy capital expenditure, without having a clear idea as to the next fund-raising to be effected.'[12]

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[11] P. J. Grant, 'Financing the Acquisition', one of the papers in *Company Mergers and Acquisitions*, ed. R. V. Arnfield (University of Strathclyde, 1968), p. 5 (8).

Characteristics of the parties

In a specific case, how might the forgoing framework be used to guide the acquisition-financing decision? It is a matter of examining the joint income stream which will result from the combination of the two firms. The quantity and variability of this prospective income stream will determine the appropriate financial structure at the time of the acquisition. Particularly important, given the low cost of loan capital, is an appraisal of how much 'debt' (a useful synonym for loan capital) the combination will be able to support. From earlier discussion the reader will see that this limit will be set by two connected considerations:

(*a*) The risk, for example in recession conditions, of having insufficient cash to meet the contractual commitment to the providers of loan capital.

(*b*) The increased cost of equity finance which would result from exposing ordinary shareholders to an unduly variable return.

Both criteria must be borne in mind in determining the amount of loan capital to be used in the acquisition. The former limit is considered by Donaldson under the title of 'debt capacity.'[13] Essentially he considers that debt capacity is limited by the risk of running out of cash in a recession and of being thereby unable to meet the contractual interest and repayment obligations to lenders.

His approach is based on a projection of cash flows under assumed recession conditions of an assumed duration. The cash balance remaining at the end of the period after all mandatory cash outflows have been paid indicates the amount of additional debt charges which could now be incurred without risk of insolvency.

The relative likelihood of different degrees of recession can be introduced into the analysis using a probability distribution. This enables management to examine which degrees of adversity they can afford to ignore, having regard to the small chance of their occurrence.

The analysis can also be adapted to allow for cash outflows which, although not mandatory, management would wish to continue for policy reasons, even during a recession – for example, maintenance of preference and ordinary dividends. The procedure is to deduct these outflows from the cash balance remaining, arrived at as above, thereby reducing the minimum regarded as available for servicing debt.

Such an approach to measuring corporate debt capacity is conceptually superior to the arbitrary rules of thumb advocated in much of the literature. For example, only in very approximate terms – if at all – can one envisage a relationship between 'loan capital two and a half times covered by assets' or 'interest five to six times covered by book profits' and an enterprise's ability to service loan capital – yet such criteria are put forward in many of the books and articles on business finance.

Admittedly the external analyst, lacking knowledge of the forecasts of future cash flows which will be available to management, is forced back on broad estimates, but perhaps a broad estimate of the company's cash flow behaviour under recession conditions would be more valuable than the application of a rule of thumb.

The internal analyst or the merchant banker advising on the form of purchase consideration to be used in an acquisition is better placed in this respect than the external analyst. However, he faces the problem of having to contend with potential lenders who either lack detailed information or who, even if they were in the position to make the necessary cash flow forecasts, might still be influenced in their judgment of the company's debt capacity by arbitrary rules of thumb. To issue loan finance to an extent not satisfactory by these criteria might be difficult in practice other than on unfavourable terms or at the risk of antagonising existing and potential lenders.

The market price of the company's ordinary shares might also be depressed since existing and potential shareholders, also judging the company by irrational rules of thumb, might erroneously consider themselves to be unduly exposed to the risk of the company's insolvency.

One is forced to the conclusion that, until the market in which securities are traded learns to apply more rational criteria, a company should arrive at its debt capacity by estimating the amount of loan capital which, having regard to prospective cash flow behaviour in recession conditions, it can afford to take on, but bearing in mind that it may be necessary to modify the resulting proposal towards a more conventional structure in order to ease market acceptance.

Having determined the amount of debt which *could* be raised without risk to solvency and without risking inability to meet proposed policy expenditures, the next question arising is: How much loan capital will the equity shareholders countenance without feeling that their return will be unduly variable? Research has not yet provided a means of arriving with any precision at the optimal financial structure in this sense. Management may seek guidelines in the variability of earnings experienced by their shareholders in the past. This may be compared with the prospective variability, assuming a range of debt-equity mixes and a range of possible future joint trading results.

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[12] P. J. Grant, op. cit., p. 5(1).

[13] G. Donaldson, *Corporate Debt Capacity* (Harvard University Press), 1961.

Constraints on optimality

What constraints will in practice compel departure from the optimal method of financing the acquisition?

The outgoing shareholders will need to be persuaded to part with their holdings. This will entail compensating them to an extent and in a form which they will find acceptable.

Taxation considerations are important here. The shareholder who is not liable to income tax, either because his income is too low or because he is classed as tax-exempt (e.g. a pension fund), is indifferent from the taxation point of view between dividends and capital gains. By contrast, the shareholder who suffers a high combined rate of income tax and surtax will prefer capital growth to dividends: chargeable capital gains are taxed at a maximum of 30 per cent whereas dividends will be taxed at a rate of up to 88·75 per cent.

The high surtax payer would therefore be pleased to be offered shares of the acquiring company if that company's policy is to retain a high proportion of its earnings. The tax-exempt shareholder might be either indifferent or hostile to such a settlement. In addition, the acquirer will usually face the problem of different shareholders falling within different tax brackets. A solution is to offer a choice, for example, between shares and high-yielding loan stock in the new combination.

Capital gains tax considerations will influence the choice between offering cash or securities. When a subject company shareholder receives cash in exchange for his holding he will be liable to capital gains tax on his profit, unless he is tax-exempt or can make use of offsetting losses. Where he acquired the securities before 6 April 1965, no liability will arise unless the cash he receives produces a gain in relation to the price at that date. Consequently, the acceptability of *cash* will depend on the tax status of the shareholders of the subject company and on the date and price at which they acquired their shares. No potential gains tax liability arises when the purchase price is settled in *shares* or *loan stock*, since no chargeable disposal is regarded as having been made by the vendor-shareholders. To overcome the problem of shareholders with differing preferences in this respect, the acquirer might make an offer of securities underwritten for cash as explained earlier.

The form of purchase consideration must comply with the degree of risk aversion of the outgoing shareholders. For this reason it may not be possible to offer securities of the acquiring company if these are of an unacceptable risk category. The shareholders of a company with stable earnings and dividends are unlikely to welcome the 'paper' of an acquiring company whose earnings and dividends are subject to steep rises and falls due, for example, to a combination of high gearing and business risk. A cash offer might be required in such a case.

The acquirer may be concerned with shareholders who need to rely on a regular cash income to meet their commitments. An institutional shareholder such as a pension fund dare not put payments to pensioners at risk. A unit trust may be committed to a policy of providing high income to its unit holders.

The vendor-shareholders will also have less rational 'short-term' requirements which must also be allowed for if their acceptance of the offer is to be obtained. For example, whatever the *long-term* income prospects of the securities offered, the vendors will also need to be satisfactorily compensated in terms of *current* earnings per share. Short-term 'dilution' must be avoided. Even though their own company's latest earnings may overstate prospective earnings or may be unreliable, and even though the current earnings per share of the acquirer may understate its prospective earnings, the vendors will be unwilling to exchange high current earnings per share for low current earnings per share. A loan stock element or a convertible loan stock with an appropriate interest rate may serve to meet this short-term requirement. The misleading conclusions which may be drawn as a result of such undue preoccupation with current earnings per share are well described by Keane.[14]

The short-term dividend requirement of the vendor shareholders also needs to be considered. The acquirer may be a company which retains for expansion a high proportion of its earnings. The subject company may be engaged in a declining industry, paying high dividends for lack of investment opportunities and perhaps in the hope of warding off a takeover bid. The acquirer faces the problem of matching the high current dividend per share which is being received by the subject company's shareholders. Loan stock might again be used towards solving this difficulty.

The acquirer-shareholders have short-term requirements which parallel those of the vendors. Unless acquiring management takes account of these, the stock market price of the acquirer's shares will be adversely affected, at least in the short term. The form of purchase consideration should accordingly avoid as far as possible 'dilution' of the short-term earnings and dividends of the acquirer shareholders.

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[14] S. M. Keane, 'A Warning Note on Earnings per Share', *The Accountants Magazine*, Vol. 75, No. 782, August 1971.

The decision in practice

The foregoing framework attempts to isolate the components of the acquisition financing decision. The final stage of the presentation is to set against this background some points which arose during conversations held with companies and their advisers. The small number of conversations conducted so far do not permit generalisation about attitudes and practice in the field. However, they serve to indicate some of the problems encountered in practice by managers contending with the acquisition-financing decision.

Whilst accepting in general terms the theoretical framework set out in this paper, managers did not think it possible to apply it at all rigorously in practice. In view of the impracticability of making the long-term forecasts needed for an optimal or near-optimal financing decision, it was not considered possible, for example, to make a meaningful appraisal of corporate debt capacity along the lines suggested earlier in this paper. Respondents were sceptical as to the feasibility of predicting and assigning probabilities to cash flows for more than a year or so ahead. Thus, the conventional 'rules of thumb' were resorted to, partly on the grounds that the market would judge the company by these criteria, partly *faute de mieux*, and partly on the grounds that time had proved them as a means of avoiding disaster. Furthermore it was argued that, given the need to offer equity to outgoing equity shareholders, there was not often the opportunity to approach the corporate debt limit in the acquisition situation.

The increasing reluctance in recent years on the part of equity shareholders to accept 'straight' loan stock virtually forced departure from optimality: some form of equity 'sweetener' either in the form of conversion rights or equity warrants was usually required. This was especially the case when the subject company was in a strong bargaining position, for example in a contested bid.

The less rational requirements of the outgoing shareholders were viewed as a dominant influence on the form of purchase consideration which had to be offered. For example, it was frequently considered necessary to offer a convertible stock whose interest rate would compensate outgoing shareholders for short-term earnings and dividend dilution.

In the face of these difficulties and constraints, is there any practical point in discussing criteria for the optimal financing of an acquisition? The suggestion here is that the answer is 'yes' for four reasons:

(*a*) Long-term forecasts may indeed be extremely inaccurate but decisions based on an albeit crude estimate of relevant things are more likely to turn out right than those based on a more accurate estimate of irrelevant things. As Merrett and Sykes point out: 'That all the facts relevant to business decisions cannot be known is no justification for abandoning a rational approach or making do with rough and ready rules of thumb . . .'[15]

(*b*) The need to comply with the requirements of outgoing shareholders is recognised. However, the danger to be avoided is of regarding acceptability to the vendor-shareholders as the *objective* of the financing decision rather than as a *constraint* on optimality.

(*c*) Whilst acquiring management has to contend with the short-term irrational requirements of its own shareholders, it is worth considering how far these are being served at the expense of these shareholders' longer-term interests.

(*d*) There are signs of increasing sophistication and more 'long-term' thinking among shareholders and lenders – particularly institutions. The larger stockbrokers, with the aid of computers, are able to prepare and analyse forecasts of results for a number of years ahead. Institutional lenders increasingly concern themselves with borrowers' prospective cash flows and less with conventional rules of thumb. This is a further reason for management's increased attention to long-term, rational financing criteria.

Growing recognition of the need for more formal long-term financial analysis is exemplified by the reference in *The Times* (26 May 1970) to Chemical Bank's computer model: 'The bank's merger analysis model provides a speedy mechanism for simultaneously calculating the effect of alternative merger proposals. The computer can determine the effect of paying six different purchase prices made up from ten different combinations of cash, stock and shares while still taking account of such events as a re-evaluation of the bidder's shares on the stock market.'

Conclusion

Given the constraints and difficulties within which the acquisition financing decision must be made, it will rarely be possible either to compute with any precision, or to use in practice the optimal form of purchase consideration. Despite this, the emphasis in the decision-making process should be on financing the acquisition in a way which promises to depart least from long-term optimality.

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[15] Merrett, A. J. and Sykes, A. *The Finance and Analysis of Capital Projects* (Longmans, 1963), Introduction, p. XIII.

Acknowledgement

The author is grateful to Mr B. Allison, Senior Lecturer, Department of Management Studies, Salford University, for helpful discussions in connection with this article.

Comparative Costs of Undergraduate Education in the University of Bradford, 1966-7 and 1969-70

R. Khanna-Bardouille

Introduction

Total costs per student were calculated in various disciplines at the University of Bradford during the academic years 1966–67 and 1969–70 separately. The disciplines covered were: Mechanical, Chemical, Civil and Electrical Engineering; Applied Physics, Material Science, Ophthalmic Optics, Industrial Chemistry, Colour Chemistry, Mathematics and Statistics and Textiles Technology; Pharmacy and Biological Sciences; and Modern Languages, Social Sciences and Management Administration.[1] The purpose of this paper is to compare the costs of training an undergraduate student in 1966–67 with those for 1969–70. The former are brought to the 1969–70 level by using alternative methods of price adjustment. The adjusted 1966–67 costs are then compared with those for the calculated 1969–70 academic year. The purpose of a comparative cost analysis is to investigate cost trends between these two periods of study. The schematic presentation of the paper is as follows.

In Section 1 we list various cost elements deemed necessary for undergraduate degree programmes. The method of calculating the contribution of such cost items to various types of undergraduate courses is described elsewhere.[2] The calculated total costs per student by discipline for the academic years 1966–67 and 1969–70 are given separately in Table 1. We bring the 1966–67 costs to the 1969–70 level by using alternative methods of price adjustment. The adjusted costs are then compared with the calculated 1969–70 costs per student.

The sensitivity of results obtained from alternative methods of price adjustment is tested one against the other. In Section 2 the paper is summarized together with some conclusions that might arise out of the work. The limitations of a comparative cost exercise based on two years of analysis are borne in mind. Therefore, caution must be exercised in drawing conclusions from the study.

Section 1: Cost study

We first list different cost elements building up total costs per student in various undergraduate disciplines chosen in the study. We then give the calculated cost for each such cost item deemed necessary for undergraduate training. The total costs were calculated on an annual per student basis. They are sub-divided under the following categories:

(1) Annual capital and maintenance expenditures of University buildings:

(*a*) annual amortisation and interest on the capital invested in the buildings;

(*b*) annual amortisation and interest on the capital value of furniture and non-teaching equipment in the buildings;

(*c*) annual interest on the capital value of land, but no amortisation since such land never depreciates;

(*d*) annual maintenance expenditures such as heating, water charges, salaries and wages of superintending staff, etc.

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[1] The University of Bradford runs sandwich courses, i.e. a part of the academic year or *one whole year* is spent outside the University for industrial training. Such courses as require *a part* of the academic year in industrial training are 'thin' sandwich courses of which Mechanical, Chemical and Electrical Engineering; Applied Physics, Material Science, Mathematics and Colour Chemistry are all examples. Courses in which one whole year is spent in industry are 'thick' sandwich courses of which Civil Engineering, Industrial Chemistry, Biological Sciences and Textiles Technology are the examples. The duration of sandwich courses is for four years, unlike Social Sciences and Ophthalmic Optics where there is no industrial training and the courses last for three years only.

[2] For a detailed method of calculating the total costs per student for 1966–67, see author's paper with A. Bottomley on 'Costs and Returns on Graduates at the University of Bradford', *Accounting and Business Research*, No. 1, Winter 1970. For the 1969–70 costs, see author's Ph. D. thesis on 'Cost-sensitivity Analysis in Higher Education' (Unpublished thesis, University of Bradford, 1972), ch. V, pp. 59–81.

(2) Salaries and fringe benefits of teaching staff.

(3) Salaries and fringe benefits of technical staff.

(4) Expenditures on teaching equipment and materials.

(5) Administrative expenditures:

(*a*) general–salaries and fringe benefits of central administrative staff plus expenditure on office equipment and materials;

(*b*) school secretarial staff salaries and expenditure on office equipment and materials.

(6) Library expenditures – salaries and fringe benefits of library staff and book and periodical expenditures.

(7) Student facility, general educational and miscellaneous expenditures.

The calculated costs in each of the above items of expenditure are given in Table 1 (see parts A and B for the 1966–67 and 1969–70 costs per student respectively).

Methods of comparison

We discuss alternative methods of adjusting the 1966–67 costs per student to the 1969–70 price level

TABLE 1

Total costs per undergraduate student by discipline (in £ sterling) University of Bradford

A 1966–67

The calculated course cost per student by items of expenditure

Disciplines	*Annual capital and mainten-ance costs* 1	*Teaching staff salary costs* 2	*Technical staff salary costs* 3	*Teaching equipment and materials expendi-tures* 4	*Total admini-strative costs* 5	*Library costs* 6	*Student facility and miscel-laneous expendi-tures* 7	*Total course costs* 8
Mechanical Eng.	1,548	738	212	412	344	48	108	3,410
Chemical Eng.	704	792	160	182	360	44	108	2,350
Electrical Eng.	1,156	803	153	259	352	44	108	2,875
Applied Physics	980	906	142	568	352	88	108	3,144
Ophthalmic Optics	957	1,028	156	494	264	66	81	3,046
Ind. Chemistry	1,818	592	99	140	380	88	108	3,225
Col. Chemistry	1,437	1,183	237	302	285	66	81	3,591
Mathematics/Statistics	866	901	18	18	340	88	108	2,339
Textiles Tech.	872	789	17	214	352	88	108	2,440
Pharmacy	1,071	803	209	213	261	81	81	2,719
Biological Science	1,028	1,089	257	435	368	108	108	3,393
Modern Languages	941	738	17	153	352	260	108	2,569
Social Science	749	445	4	43	264	195	81	1,791
Management Admin.	459	508	5	78	264	195	81	1,590

B 1969–70

The calculated course cost per student by items of expenditure

Disciplines	*Annual capital and mainten-ance costs* 1	*Teaching staff salary costs* 2	*Technical staff salary costs* 3	*Teaching equipment and materials expendi-tures* 4	*Total admini-strative costs* 5	*Library costs* 6	*Student facility and miscel-laneous expendi-tures* 7	*Total course Costs* 8
Mechanical Eng.	1,768	987	452	240	408	56	80	3,991
Chemical Eng.	908	780	204	268	420	60	80	2,720
Electrical Eng.	1,278	1,073	352	344	16	60	80	3,603
Applied Physics	1,375	743	472	420	460	56	117	3,643
Ophthalmic Optics	1,011	815	354	315	345	42	117	2,999
Ind. Chemistry	1,905	600	432	300	456	54	117	3,864
Col. Chemistry	1,888	785	432	300	342	54	117	3,878
Mathematics/Statistics	735	598	—	80	428	63	117	2,003
Textiles Tech.	1,227	696	468	126	456	48	117	3,138
Pharmacy	1,446	549	474	306	303	99	117	3,294
Biological Science	849	946	339	354	412	93	117	3 110
Modern Languages	818	624	64	60	428	236	117	2 347
Social Science	548	406	18	51	303	189	117	1 632
Management Admin.	710	486	42	165	387	207	117	2,114

in relation to various cost elements deemed necessary for the training of undergraduates in different disciplines. These methods are applied to each of the cost components in turn.

1 *Annual capital and maintenance expenditures*

We take the 'Main Building' of the University of Bradford to illustrate the methods used in adjusting the annual building expenditures in 1966–67 to 1969–70 price level. The composition of the annual expenditure for this building in 1966–67 was: (*a*) annual interest and amortisation on the capital value of the building formed 49·33 per cent; while (*b*) the annual interest and amortisation on non-teaching equipment and furniture; (*c*) annual interest on land; and (*d*) annual maintenance expenditures accounted for 7, 0·67 and 43 per cent respectively.[3] The following methods are used to adjust the 1966–67 building expenditures to the 1969–70 price level.

Method 1: Insured capital value of buildings

We took the insured capital value of the building between 1966–67 and 1969–70 from the University books.[4] This increased by 11·62 per cent between these two years.[5] The contribution of items (*a*) to (*c*) fell in the region of 57 per cent of the total building expenditures. Annual maintenance expenditure [item (*d*)], which accounted for 43 per cent of the total building expenditure, increased by 11·90 per cent between these two years.[6] Therefore, 57 per cent [items (*a*) to (*c*)] of the building expenditure was inflated by 11·62 per cent and the remaining 43 per cent [item (*d*)] by 11·90 per cent. We rounded 11·62 and 11·90 per cent to 12 per cent to calculate the adjusted building expenditure at the 1969–70 price level. A similar method was repeated for other buildings of the University.

Method 2: University Grants Committee's (UGC) standard cost per square foot of the construction of science, engineering and arts buildings

British universities receive capital (non-recurrent) grants for the construction of new buildings separately from the annual recurrent grant. Capital grants for the construction of various types of buildings such as Science, Engineering, etc., are assessed on a 'cost per square foot' basis. The UGC's approved cost per square foot [item (*a*)] increased by 13 per cent between 1966-67 and 1969–70.[7] The cost of non-teaching equipment and furniture [item (*b*)] increased by 10 per cent during the above-mentioned period.[8] The annual maintenance expenditure [item (*d*)] increased by 12 per cent during that period.

We took the total building cost per student and inflated 50 per cent [items (*a*) and (*c*)] of the total building cost by 13 per cent; 7 per cent [item (*b*)] by 10 per cent and the remaining 43 per cent [item (*d*)] by 12 per cent. The resultant figure was the adjusted 1966–67 building expenditures to the 1969–70 price level.

Method 3: Building price index

We used building price index to adjust the 1966–67 building costs to the 1969–70 price level. The index provides statistics on changes in cost of labour and material required for the construction of new university buildings. The construction cost of new buildings [item (*a*)], and furniture and non-teaching equipment [item (*b*)] increased by 20 per cent between 1966–67 and 1969–70.[9]

Items [(*a*) to (*c*)] accounted for 57 per cent of the total building expenditure per student; the annual maintenance expenditure [item (*d*)] formed 43 per cent. Therefore, the contribution of items (*a*) through (*c*) was inflated by 20 per cent to calculate the adjusted building expenditures to the 1969–70 price level.

Method 4: Retail price index

The retail price index rose by 13 per cent between 1966–67 and 1969–70.[10] Therefore, we took the total building expenditure per student in 1966–67 and inflated this by 13 per cent to arrive at the adjusted cost figures to the 1969–70 level.

The adjusted building costs per student in different undergraduate disciplines by each of the four methods are given in Table 2.

2 *Teaching staff salary costs*

The 1966–67 teaching staff salary costs per student were adjusted to the 1969–70 level on the basis of salary increments of 17 per cent during the above

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[3] In order to avoid complications in our cost calculations, we add the contribution of item (*c*), i.e. annual interest on land, to item (*a*). Thus, items (*a*) and (*c*) formed 50 (49·33 +·67) per cent of the total expenditure of the Main Building of the University.

[4] From here on the discussion on building expenditure is related to the 'Main Building' of the University of Bradford.

[5] Source: University of Bradford, *Finance Office.*

[6] Source: University of Bradford, *University Accounts,* 1966–67 and 1969–70.

[7] Source: University Grants Committee, *Non-recurrent Grants* 1966 and 1969 (London, H.M.S.O., 1966 and 1970). The figure of 13 per cent is a calculated one.

[8] Ibid.

[9] Source: *Spons' Architects' and Builders' Price Book,* ed. Davis Belfield and Averest (London: Charter Quantity Surveyors, 1971).

[10] Annual Abstract of Statistics (London: H.M.S.O., Central Office of Information, 1970).

TABLE 2

Annual capital and maintenance expenditures per student by discipline adjusted to 1969-70 level by alternative methods of price adjustment*

(in £ sterling) University of Bradford

	Calculated cost	Adjusted cost by method			
Discipline	*cost in 1969–70*	*Method 1*	*Method 2*	*Method 3*	*Method 4*
Mechanical Eng.	1,768	1,712	1,730	1,794	1,749
Chemical Eng.	908	766	791	839	796
Electrical Eng.	1,278	1,272	1,300	1,348	1,306
Applied Physics	1,375	1,075	1,102	1,143	1,107
Ophthalmic Optics	1,011	1,056	1,074	1,134	1,081
Ind. Chemistry	1,905	2,018	2,068	2,162	2,054
Col. Chemistry	1,888	1,621	1,635	1,710	1,624
Mathematics/Statistics	735	947	973	998	979
Textiles Tech.	1,227	1,048	1,158	1,179	985
Pharmacy	1,446	1,183	1,204	1,248	1,210
Biological Science	849	1,109	1,155	1,198	1,162
Modern Languages†	818	1,008	—	—	1,063
Social Science†	548	815	—	—	858
Management Admin.	710	518	572	584	519

* Civil Engineering and Material Science disciplines are not included in our Comparative Cost Study because of the inadequate data.

† These courses are taught in rented buildings. Therefore, alternative methods of adjusting building costs are not applicable in these cases.

period.[11] No alternative method was used to adjust these costs.

3 *Technical staff salary costs*

Technical staff salaries rose by just over 30 per cent between 1966–67 and 1969–70.[12] The distribution of this increase during the above-mentioned period was as follows:

Period	*Increase in salary*
January 1968	3·8 per cent on the 1966 salaries
April 1969	6·6 per cent on the January 1968 salaries
August 1969	20·1 per cent on the April 1969 salaries

The 1966–67 technical staff salary costs were inflated by 3·8 per cent and the resultant figure was again increased by 6·6 per cent and finally by 20·1 per cent to calculate the adjusted costs to the 1969–70 level.

4 *Teaching equipment and materials expenditure*

Teaching equipment and materials expenditures were inflated using the retail price index of 13 per cent in the absence of a 'teaching equipment index' and because of the complex nature of teaching equipment used in a university.[13] The limitations of this type of index are fully realised, as there is no real connection between the 'retail price index' concerned purely with household goods and changes in the price of teaching equipment.

5 *Administrative staff salary expenditures*

Senior administrative staff (such as the Vice-chancellor's and Bursars' departments) salaries increased by 17 per cent between the academic years 1966–67 and 1969–70 while the secretarial and clerical staff salaries rose by 15 per cent.[14] In the absence of a breakdown of salaries between senior and junior university administrative staff, we decided to use the 15 per cent figure in order to adjust this cost item to the 1969–70 price level.

6 and 7 *Library, student facility and general educational and miscellaneous expenditures*

The 1966–67 costs per student for each of these items were inflated by 13 per cent using the 'retail price index'. Again, this was used due to the lack of an accumulated value for books and periodicals, etc., and the difficulty in obtaining any other price indices for the rest of the items listed in this category.

We also used 'retail price index' for the combined (total) costs per student for various items of expenditure. This meant that total costs per student in the academic year 1966–67 were inflated by 13 per cent to adjust the costs to the 1969–70 price level.

Summary

The calculated 1966–67 costs per student by discipline were adjusted to 1969–70 price level by alternative methods. This was essential to set up a reasonable case for a comparative cost study between the periods of study. Four alternative methods were used to adjust the building expenditure per student. However, for the other cost items, we used only one method of bringing the 1966–67 costs to the 1969–70 price level. The adjusted total costs per student by method are summed up in Table 3.

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[11] Source: University of Bradford, Finance Office, *UGC's Approved Increment of Teaching Staff Salary.*

[12] *Ibid, Technical Staff Salary Increment.*

[13] *Annual Abstract of Statistics,* loc. cit.

[14] Source: *UGC's Approved Salary Increment for University Administrative Staff,* loc. cit.

Sensitivity of results to methods of price adjustment

The adjusted total costs per student displayed in Table 3 may be used in calculating the percentage discrepancies between the methods employed over the calculated 1969–70 costs. This is given in Table 4 below.

Reading Table 4 carefully, it is clear that the discrepancies between the methods do not exceed 6 per cent with the exception of Textiles Technology and Management Administration courses, where these are of the order of 9 per cent. But under no

TABLE 3

Total costs per student adjusted to the 1969-70 price level by alternative methods (in £ sterling) University of Bradford

Disciplines	*Calculated total costs per student in 1969–70*	*The 1966 total costs,per student adjusted by method**			
		Method 1	*Method 2*	*Method 3*	*Method 4*
Mechanical Eng.	3,991	3,913	3,931	3,995	3,835
Chemical Eng.	2,720	2,742	2,767	2,815	2,656
Electrical Eng.	3,603	3,334	3,362	3,410	3,249
Applied Physics	3,643	3,585	3,612	3,653	3,553
Ophthalmic Optics	2,999	3,538	3,556	3,586	3,442
Ind. Chemistry	3,864	3,710	3,760	3,854	3,644
Col. Chemistry	3,878	4,205	4,219	4,294	4,058
Mathematics/Statistics	2,003	2,700	2,725	2,750	2,642
Textiles Tech.	3,138	2,920	3,030	3,051	2,757
Pharmacy	3,294	3,171	3,192	3,236	3,072
Biological Science	3,110	3,947	3,973	4,016	3,834
Modern Languages	2,347	3,035	3,035	3,035	2,901
Social Science	1,632	2,123	2,123	2,123	2,024
Management Admin.	2,114	1,936	1,990	2,002	1,797
Average	3,026	3,204	3,234	3,273	3,106

Source: See text.

* Method 1 – Insured Capital Value of Buildings.
Method 2 – U.G.C's Construction Cost Index.
Method 3 – Builders' Price Index.
Method 4 – Retail Price Index.

TABLE 4

Percentage discrepancies in the adjusted 1966-67 costs over the calculated 1969-70 costs by alternative methods of price adjustment*

University of Bradford

Disciplines	*Adjusted cost discrepancy by method as a percentage of the calculated 1969–70 cost per student*			
	Method 1	*Method 2*	*Method 3*	*Method 4*
Mechanical Eng.	+ 2·00	+ 1·54	—	+ 3·46
Chemical Eng.	– 1·00	– 2·00	– 3·00	+ 2·00
Electrical Eng.	+ 7·46	+ 6·69	+ 5·36	+ 9·80
Applied Physics	+ 1·60	+ 0·85	—	+ 2·47
Ophthalmic Optics	–18·00	–18·57	–19·57	–14·70
Ind. Chemistry	+ 4·74	+ 3·20	+ 0·70	+ 6·20
Col. Chemistry	– 8·43	– 8·80	–10·73	– 4·64
Mathematics/Statistics	–34·80	–34·00	–37·30	–31·90
Textiles Tech.	– 6·95	+ 3·44	+ 2·70	+12·46
Pharmacy	+ 3·73	+ 3·10	+ 1·80	+ 6·74
Biological Science	–27·00	–28·00	–29·00	–24·00
Modern Languages	–29·00	–29·00	–29·00	–24·00
Social Science	–30·00	–30·00	–30·00	–24·00
Management Admin.	+ 8·42	+ 6·00	+ 5·00	+15·00

* The disciplines where the calculated 1969–70 total costs per student are greater or less than the adjusted 1966–67 costs are shown by the plus (+) or minus (–) signs respectively.

circumstance does it exceed 10 per cent. A discrepancy of 6 per cent was expected and it is only where the figure exceeds 6 per cent that doubts begin to arise in relation to the choice of methods used in adjusting the costs to the 1969–70 price level. Comparing the adjusted costs obtained by methods 1 and 3 with those by 2 and 4, a close relationship of the linear form was obtained.

The validity of any one method employed having been demonstrated, the net savings and losses per student by discipline in 1969–70 over the academic year 1966–67 are given in Table 5.

An interesting conclusion (which seems to contradict the general belief that costs of higher education are rising) invited by the study is that overall, when 1966–67 costs per student are compared with those for 1969–70, the University of Bradford seems to have made a saving of 8 per cent per average undergraduate student in 1969–70 over the 1966–67 period. However, this varied between disciplines covered in the study (see Table 5).

Section 2: Summary and conclusions

The total costs per student by undergraduate discipline in 1966–67 were compared with those for the academic year 1969–70. Alternative methods were used to bring the former to the 1969–70 price level.

A cost discrepancy within 6 per cent between the methods of price adjustment was calculated for the disciplines covered in the study. However, two disciplines – Textiles Technology and Management Administration – showed a discrepancy of the order of 9 per cent.

A discrepancy up to 6 per cent was expected in the analysis, the reason being that the alternative methods used in adjusting the 1966–67 costs to the 1969–70 price level related to only one item (building expenditure) of the total costs per student and moreover for only a part of that cost component. Out of the total building expenditures, the annual interest and amortisation on the construction value of the building comprised a little more than half (57 per cent), while the maintenance expenditure formed 43 per cent. Four alternative methods were used to adjust the construction cost element of the total building expenditures. The increase in the construction value of the buildings ranged between 12 and 20 per cent by Methods 1 (Insured capital value of buildings) and 3 (Builders' price index) respectively. On the other hand, a single method was used to adjust the maintenance part of the total building costs. This means that 57 per cent of the total building expenditures per student was inflated by between 12 and 20 per cent, but 43 per cent by 12 per cent only. This shows clearly that the alternative methods of price adjustment were related to a part of that cost component. Therefore, a cost discrepancy of up to 6 per cent between the methods used was expected.[15] In the case of other cost items, no alternative methods were employed. Therefore, it was because of the building expenditure that a different set of the adjusted cost figures was obtained.

The analysis revealed cost discrepancies of the

TABLE 5

Percentage savings and losses in total costs per student in 1969-70 over the academic year 1966-67

University of Bradford

Discipline	*Calculated 1969–70 cost per student*	*Adjusted 1966–67 total cost/student at 1969 level*	*Discrepancy in the adjusted cost over the calculated 1969–70 cost per student*	
	£	£	£	%
Mechanical Eng.	3,991	3,956	35	+ 1
Chemical Eng.	2,720	2,726	6	—
Electrical Eng.	3,603	3,335	268	+ 7
Applied Physics	3,643	3,647	4	—
Ophthalmic Optics	2,999	3,553	534	−18
Ind. Chemistry	3,864	3,741	123	+ 3
Col. Chemistry	3,878	4,166	288	− 7
Mathematics/Statistics	2,003	2,712	709	−35
Textiles Tech.	3,138	2,940	198	+ 6
Pharmacy	3,294	3,154	140	+ 4
Biological Science	3,110	3,942	832	−27
Modern Languages	2,347	2,967	620	−27
Social Science	1,632	2,073	441	−27
Management Admin.	2,114	1,931	183	+ 9

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[15] A cost discrepancy of this order between the methods used is discussed in detail; see author's Ph.D. thesis, *op. cit.* pp. 103–104.

order of 9 per cent in Management Administration and Textiles Technology courses. This is where the doubts began to arise about the validity of the methods used. It was found that this was partly due to a reduction of students (Textiles Technology course) enrolled in 1969–70 over the 1966–67 period and partly because high rank staff were being employed (for example, in Management Administration department). Moreover, this was also due to major adaptations and extensions of certain buildings (Management Administration). The discrepancy of an additional 3 per cent could have been mitigated but for the above-mentioned factors.

The validity of choosing any one of the four methods was revealed when a linear relationship was obtained by plotting alternative methods against each other.[16] The results of the comparative study showed a saving of 8 per cent per average undergraduate student in 1969–70 over the 1966–67 academic year. The savings in seven disciplines ranged between 7 and 35 per cent and losses in seven disciplines between 1 and 9 per cent, and costs in two courses broke even; thus giving a net saving of 8 per cent per average undergraduate student in the University of Bradford.

The study also showed that economies of scale had been effected in certain disciplines (Modern Languages and Social Sciences), where student intake increased significantly, for example 104 per cent in Modern Languages, in 1969–70 over the 1966–67 academic year. An overall increase in student intake of 17 per cent in the whole university affected the student facility and central administrative expenditures per student favourably.

The number of teaching staff and the ratio of academic staff by rank remained unchanged during the two periods of study except for the Management Administration department where the employment of high rank staff increased in 1969–70 over the academic year 1966–67.

The technical staff salary costs as a proportion of the total annual expenditures of the university increased in 1969–70 over the 1966–67 period. This was revealed in the high cost of laboratory based courses, where no significant savings were realised between the two periods of study. However, this was exceptional in the case of the Biological Science discipline which showed a saving of 35 per cent per student in 1969–70 over 1966–67. This was perhaps due to an increase in student intake in 1969–70. However, major savings were calculated in non-laboratory based courses such as Social Sciences, etc.

It is important to point out that savings of 8 per cent per average undergraduate student in 1969–70 over the 1966–67 academic year are subject to the methods of adjusting the costs of the latter to the 1969–70 price level. Therefore, caution must be exercised in drawing any conclusions that might seem obvious from the study.

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[16] *Op. cit.*, see graph 5(5), p. 101.

Materiality—a Note and a Reply

Kenneth A. Sherwood and Benzion Barlev

Note by Kenneth A. Sherwood

I read with interest Dr Barlev's article in the Summer 1972 edition of *Accounting and Business Research* on 'Materiality'. He suggested that materiality should be related to the decision-making process by the user of a set of accounts. This was best illustrated in the case of a quoted company.

His proposal was based on the premise that an investor, before buying or selling shares, takes into account the costs of carrying out the transaction. He suggested that the transaction costs thus provide a buffer within which the share price can vary without affecting an investor's decision to buy or sell. If this buffer were divided by the P/E ratio a figure would be arrived at by which earnings could vary without affecting an investment decision.

In the context of the UK it seems reasonable to suggest that the transaction costs ought to take into account the 'jobber's turn' on a transaction; a movement therefore on an average share price of, say 2 per cent, is therefore unlikely to be significant. However, since Dr Barlev suggests a constant P/E ratio, this is equivalent to an elasticity of only 2 per cent in reported earnings, which I think even Dr Barlev would consider to be too narrow a range of materiality.

The fallacy of Dr Barlev's argument is that he is trying to set limits on materiality by reference to a completely different factor, viz: the effect on the investor of movements in the share price. In the shares of a smaller public company such price movements are likely to be more violent than in the 'blue chip' companies. Is he suggesting that materiality is a factor depending on the size of the company? Can he seriously propose that a 4 per cent error could be tolerated in the reported earnings of a 'new issue' but that a 1 per cent error could not in a leading industrial share?

Reply by Benzion Barlev

The interesting comment by Mr Sherwood contains a number of points that require further elaboration.

Mr Sherwood suggests that 'in the context of the UK . . . the transaction costs ought to take into account the "jobber's turn" on a transaction'. I fully agree with him that the jobber's turn is a part of the transaction costs, but as I tried to make my paper as general as possible, I did not specify what should be included in the transaction costs. This question has recently been discussed by Professor Harold Demsetz of the University of Chicago who writes: 'Transaction costs may be defined as the cost of exchanging ownership titles . . . It is possible to increase or decrease this cost by a more or less inclusive definition of which activities are to be counted as transaction activities.'[1] Professor Demsetz then suggests that under a narrow definition transaction costs on the New York Stock Exchange consist mainly of brokerage fees and ask-bid spreads. The latter should be considered part of the transaction costs since they represent a mark-up for costs that are 'borne by persons who specialize in standing ready and waiting to trade with the incoming orders of those who demand immediate servicing of their orders.'[2]

If we adopt the narrow definition of transaction costs and omit such costs as inquiring about stocks, calling and consulting with brokers, etc., we can sum up the transaction costs on the London Stock Exchange as follows:[3]

(1) Stockbroker's commission, which is charged to both sellers and buyers, and, in general, amounts

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[1] Harold Demsetz, 'The Cost of Transaction', *Quarterly Journal of Economics*, Vol. 82, No. 1, February 1968, p. 35.

[2] Ibid.

[3] J. Dundas Hamilton, *Stockbroking Today* (London, MacMillan & Co. Ltd., 1968), Ch. 3, especially pp. 63–69.

to 1¼ per cent of consideration.

(2) Contract Stamp, which is affixed to both sale and purchase and is based on the value of consideration (it is, however, a minor sum).

(3) Registration Fee of 12½p per transfer deed.

(4) Government Transfer Stamp Tax, which is payable on the purchase of stocks and shares. This tax is determined according to a given table and amounts to 1–2 per cent of total consideration.[4] (As the share price goes up the tax approaches 1 per cent.)

(5) The Jobber's Turn.

The last differs from the other four – institutionally determined – components since it varies and is affected by factors such as the time rate of transactions, waiting costs, the competition the jobber faces and the price of the security. However, this does not create any problem of measurement.

Mr Sherwood is on less secure ground in suggesting that a criterion of only 2 per cent is 'too narrow a range of materiality.'[5] The money market provides many examples where a difference of a fraction of a percentage point is enough to move huge funds. Since Mr Sherwood does not say just why he thinks that 2 per cent is too low a threshold, it seems to me that he may be implicitly advocating the intuitive or experience-and-education method of determining materiality. But the crux of my paper is that I believe that intuition can be usefully replaced by a model based on the decision-making process of users of financial statements – an approach that has recently received strong support.[6] If the model dictates that an item of 2 per cent of current earnings might affect the decision of investors, this item should be regarded as material.[7] It might well be, however, that a more inclusive definition of transaction costs should be adopted. More transaction activities and the income tax effect should be studied, measured and taken into consideration. This would raise the threshold of materiality.

Mr Sherwood argues further that I am using share price fluctuations to determine materiality. It must be made clear that I am *not* suggesting the use of share price movements to determine materiality. My argument relies on the investor's stock evaluation model. This model is not in any direct way affected by price movements.

Hence it follows that Mr Sherwood's last point that the proposed criterion depends on company size is not valid. However, if we accept his suggestion and consider the jobbers turn as part of transaction costs, there will be inter-firm differences in transaction costs and hence in the materiality threshold. This, I think, should not cause any surprise, any more than the fact that investors evaluate earnings of different companies differently.

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[4] Note that this creates a problem of asymmetry, since transaction costs on purchase are higher than those on sale and the positive limit will be higher than the negative one.

[5] In any case it is not clear that the figure should be 2 per cent which is probably too low a figure for the costs of purchasing a stock, though it might sometimes be correct for sales.

[6] Robert K. Jaedicke, 'Discussion of "Toward an Empirical Measure of Materiality"', *Empirical Research in Accounting: Selected Studies*, 1970, pp. 149–153.

[7] Incidentally, I had no intention of suggesting that P/E is constant over time, an obviously unrealistic assumption, which I used only as a methodological tool to derive intrinsic value. This is evident from the discussion in the last paragraph of page 196.

Contributors to Accounting and Business Research

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